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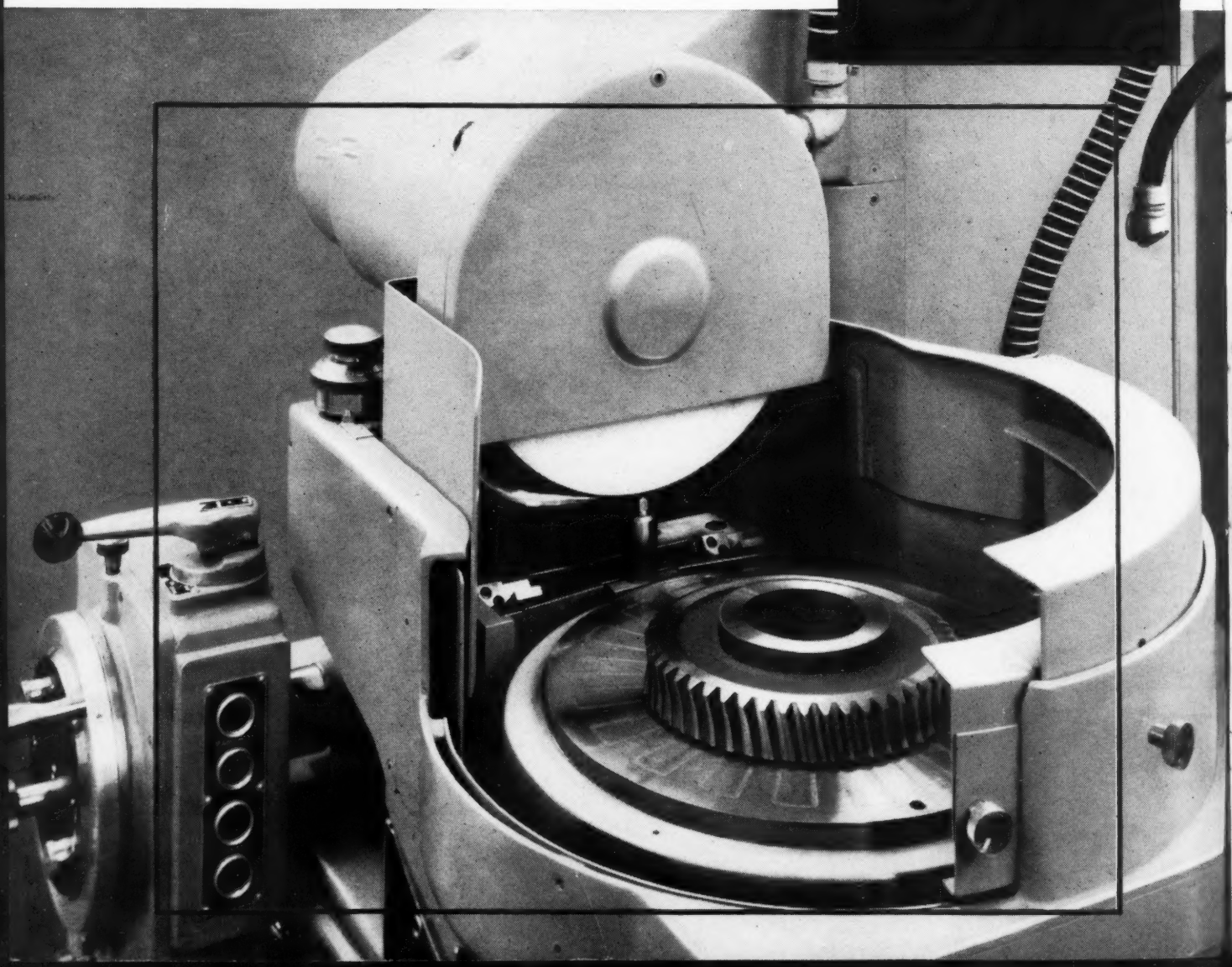

Design, Construction, Operation of Metal-Working Equipment and Manufacture of Metal Products

MACHINERY

VOLUME 54 JUNE, 1948 NUMBER 10

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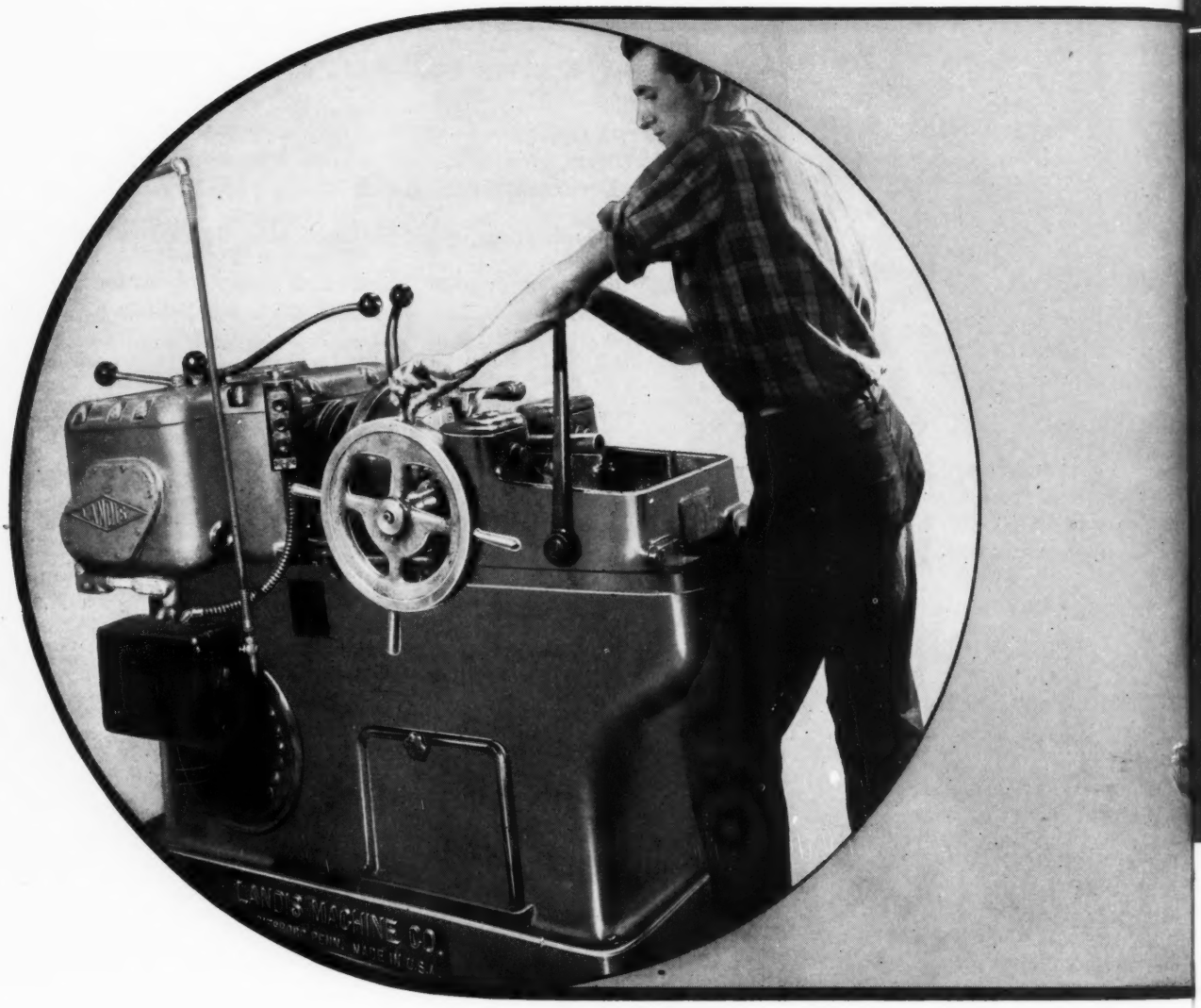
LANDMACO *Pipe*



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The Landmaco Single Head Pipe and Nipple Threading Machines, equipped with the Lanco Semi-Receding Internally Tripped Pipe and Nipple Die Head, is illustrated producing 1¼" diameter tapered pipe threads on blank steel pipe. The machine is being operated at approximately 63 R.P.M., and is producing nipples at the rate of 112 an hour.

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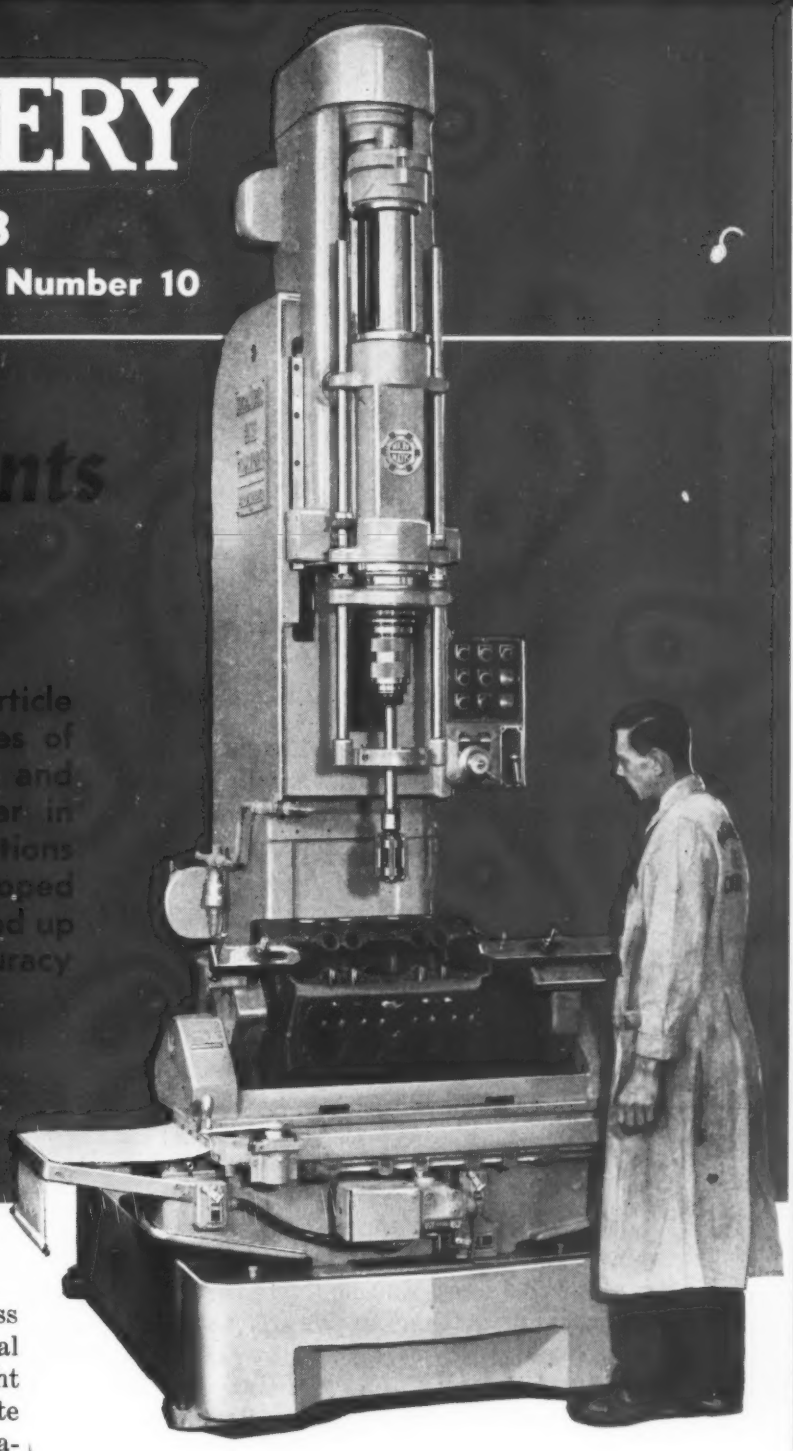
MACHINERY
JUNE, 1948
Volume 54 Number 10

New Developments in Honing

The First Installment of This Article Reviews the Fundamental Principles of the Honing Process. The Second, and Concluding, Installment, to Appear in July, will Describe Modern Applications of Honing and Recently Developed Equipment that has Greatly Speeded up the Process and Increased Its Accuracy

By CHARLES H. WICK



HONING is a production abrading process employed to remove stock from internal or external cylindrical surfaces. Straight cylindrical surfaces are generated to accurate size and with any desired surface finish. Abrasive grit bonded into stick form is applied with low unit pressures and speeds over a large area of the surface being honed. A combination of rotating and reciprocating motion is employed to actually shear metal from the surface of the work.

This process was originally developed as a quick and economical method for removing metal burrs or amorphous metal resulting from previous operations and for producing fine surface finishes on automotive cylinder bores. Now, however, it is being applied to numerous products in a wide variety of industries, and is generally employed as a stock-removing process. Automatic expansion and collapse of the abrasive sticks, improved methods of expansion and pressure application, the honing of external cylindrical surfaces, the design of progressive fixtures, and automatic sizing methods are major developments that have helped to widen the field of application of honing.

Abrading methods, such as grinding, lapping, honing, or superfinishing, differ from each other essentially in the quantity of simultaneous cutting contacts applied to the work, the direction of abrasive travel over the work surface, the rate of abrasive and work travel, the amount and method of pressure application, and—in some cases—the cutting fluid used. Since a large amount of abrasive is simultaneously brought into contact with the work during honing, the cutting action is distributed over a large area. This fact, in combination with the use of low

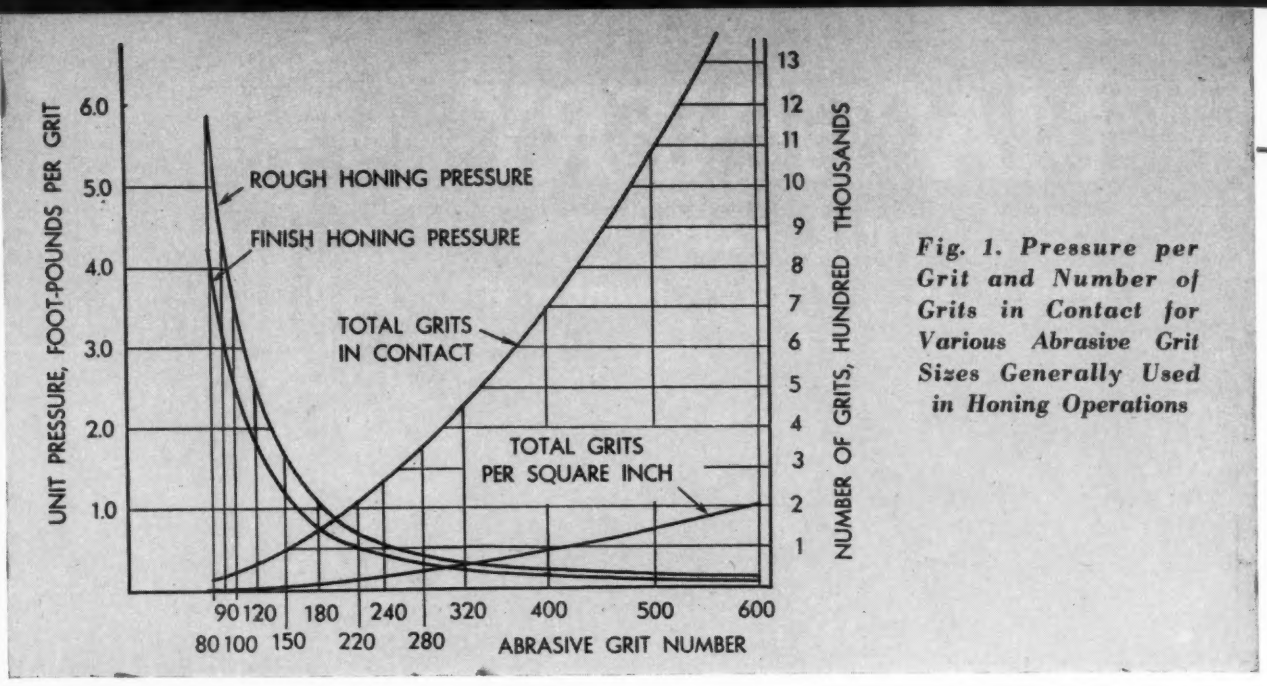


Fig. 1. Pressure per Grit and Number of Grits in Contact for Various Abrasive Grit Sizes Generally Used in Honing Operations

speeds, small pressures, and ample coolant, prevents localized heating that might cause cracks or distortion of the part being honed.

Purpose of the Honing Process

Honing is employed to obtain one or more of the following results:

1. To rapidly and economically remove stock.
2. To correct errors in shape resulting from previous operations.
3. To generate the required size within close tolerances.
4. To produce a fine surface finish of the desired type.

In certain applications, it is now possible to remove up to thirty times as much stock as could be removed in pre-war honing practice, and in some cases as much as twelve times faster. Total stock removal varies all the way from 0.0001 inch to 0.080 inch.

In general, the honing process can be employed to remove stock from bore diameters at the rate of 0.009 to 0.012 inch per minute on cast-iron parts, and from 0.005 to 0.008 inch per minute on steel parts having a hardness of 60 to 65 Rockwell C. These rates are based on parts having a length equal to three or four times the diameter. On extremely long parts, such as gun barrels, stock has been honed at the rate of 65 cubic inches per hour.

The rate of stock removal or depth of cut of the individual abrasive grains depends upon the grit and grade of abrasive, the pressure or infeed, the honing speed, and the coolant used. The actual honing time, however, depends upon the amount of stock to be removed, the type and hardness of the material being honed, and the tolerance and finish desired.

How Stock is Removed in Honing

Removal of stock in honing is accomplished by a shearing action, in which the bonded abrasive grains act as cutter tips. A large number of these carefully sized cutter tips are in simul-

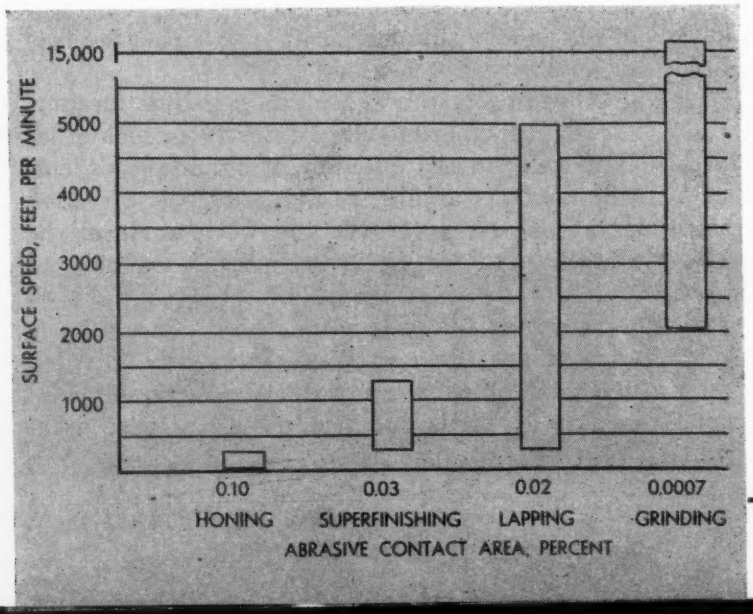


Fig. 2. General Comparison of Approximate Abrasive Contact Area and Surface Speed Employed in Various Abrading Processes

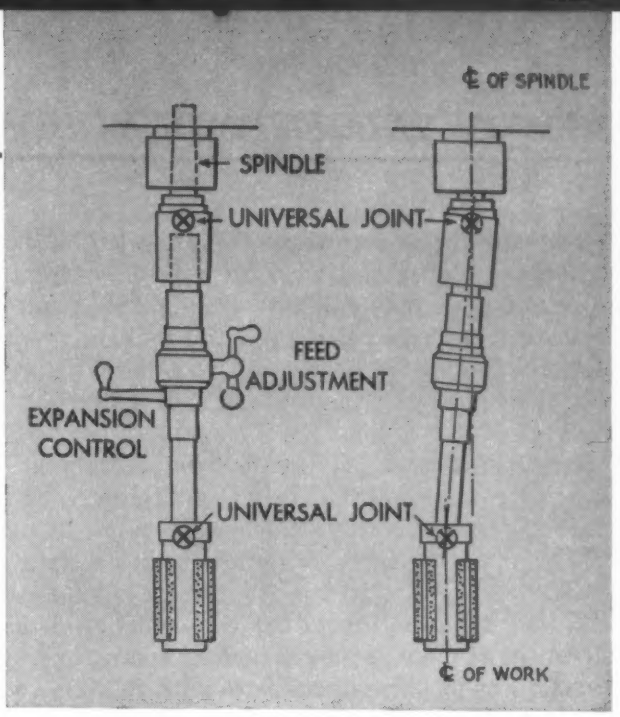


Fig. 3. Fundamental Honing Tool Construction, Indicating Pressure and Expansion Controls and Compensation for Slight Misalignment between Honing Spindle and Work

taneous abrading contact with the work, permitting rapid stock removal. Actual chips are produced; these are miniatures of those formed in machining, but they represent a substantial amount of metal, when the total volume removed is considered. Continuous chips as long as 18 inches have been recovered from certain honing operations.

A positive pressure is required to secure and maintain the desired degree of penetration of the grits into the work. The pressure used depends upon the relation between the shear resistance of the bond and the material being honed. When such pressures are distributed over thousands of simultaneous cutting tip contacts, as indicated in Fig. 1, they result in unit pressures per grit as low as 0.003 to 0.015 ounce in finish-honing, and from 0.019 to 0.324 ounce in rough-honing.

Motion is required to convert this pressure into a directional force and thus produce shearing stress. A high rate of motion tends to prevent the grits from penetrating into the work. Instead, they quickly become dull and rub over the surface in a burnishing action. A general comparison between the approximate abrasive contact area (or number of simultaneous cutting contacts) and surface speed of abrasive travel for various abrading processes is shown in Fig. 2.

Recommended honing speeds for cast iron vary from 110 to 200 surface feet per minute of rotation and from 50 to 110 lineal feet per minute of reciprocation. For steel, rotating surface speeds range from 50 to 110 feet per minute, and reciprocation speeds from 20 to 90 lineal feet per minute. The exact rotation and reciprocation speeds to be used depend upon the size of the work, the amount of material to be removed, the characteristics of the material, and the quality of the finish desired. In general, the harder the material to be honed, the lower the speed. Interrupted bores are usually honed at faster speeds than plain bores.

Correcting Shape and Generating Accurate Size

The rotary motion of the honing tool and its freedom to center itself with the neutral axis of the bore, as indicated in Figs. 3 and 4, result in correcting out-of-roundness and generating roundness. In internal honing, the tool expands gradually to the smallest diameter of an out-of-round hole so that the high spots on the surface are leveled off before any stock is removed from other areas. No stock is removed from the largest diameter, or low spots, until the hole has become round.

Rapid longitudinal reverse stroking of the tool in the bore, combined with positive expansion

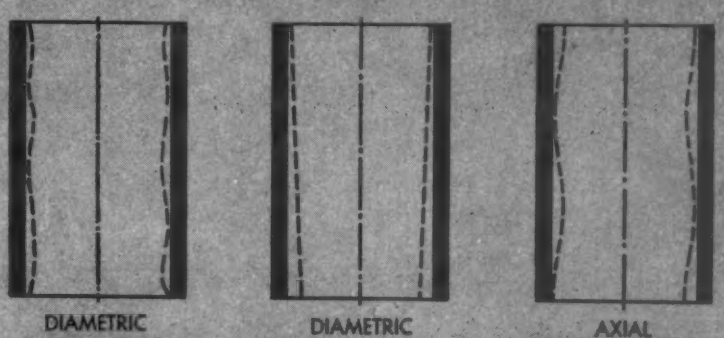


Fig. 4. Cross-sections of Work, Showing how Various Inaccuracies Can be Corrected by the Honing Process

and equalized pressure throughout the length of the honing stones and working stroke, corrects taper and generates diametric straightness. As the abrasive grits come to a tight or tapered portion of the bore, they penetrate deeper and remove more stock from that area, thus straightening the bore.

Substantial stone lengths, determined in relation to the bore length, bridge minor irregularities in the surface, thus correcting axial distortion or "snakiness" and generating axial straightness of the bore. Roundness, straightness, and axial alignment are commonly held to tolerances as close as 0.0002 inch in honing operations. The location of the bore with relation to another hole or some other part of the work cannot be changed by honing, and depends upon the accuracy of the previous operation.

Diametral size can be held within tolerances ranging from 0.0001 to 0.001 inch. Automatic sizing devices, which will be described in the next installment of this article, have eliminated the human element from the honing process.

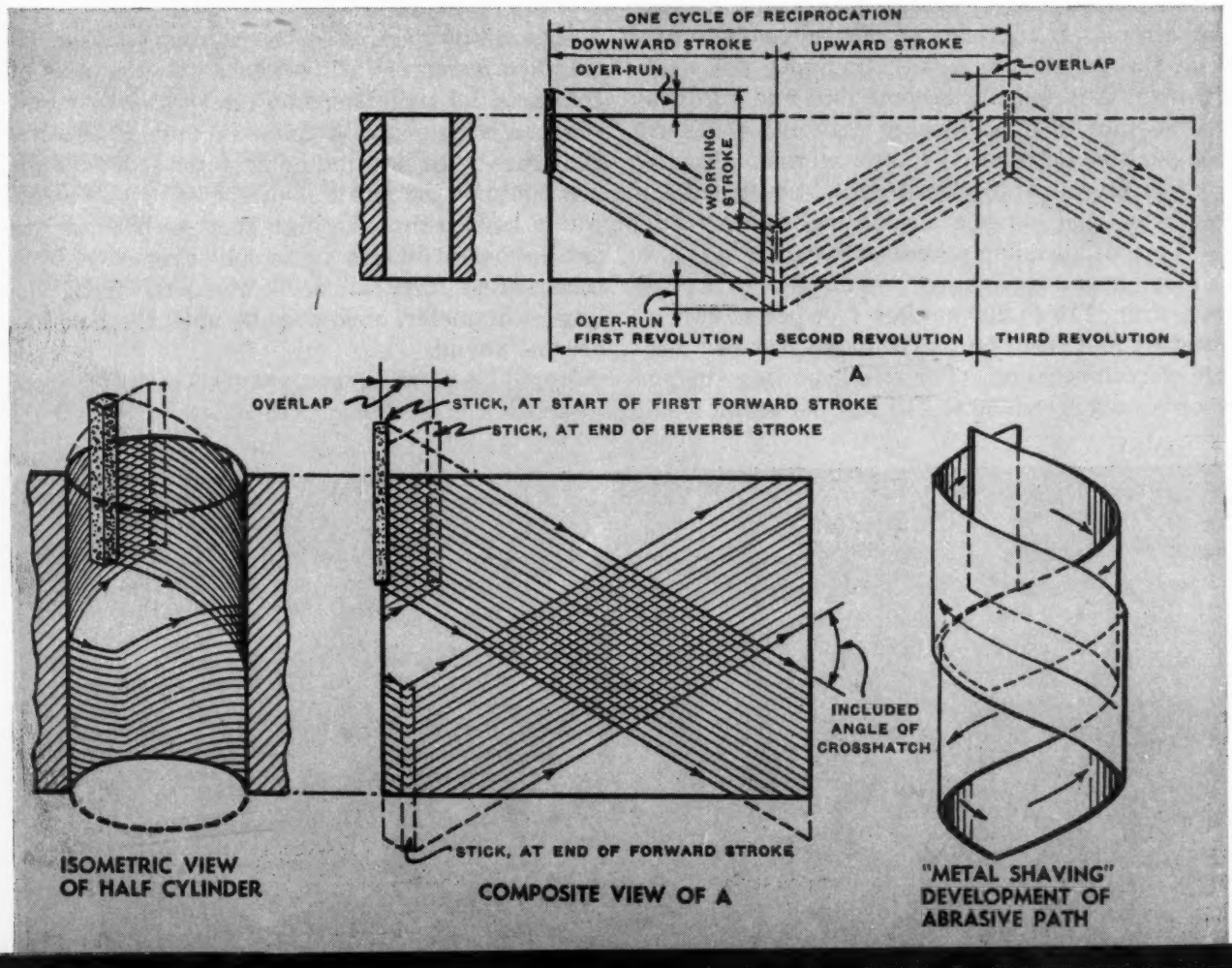
Producing Desired Type of Finish

Surfaces ranging from less than 1 micro-inch r.m.s. to a relatively coarse finish can be obtained by the proper choice of abrasive and the correct honing time. Regular or irregular cross-hatched or other types of surface patterns (commonly called "lay," and determined by the direction and depth of the abrading marks) can be formed by varying the relation of rotation to reciprocation.

The combination of rotating and reciprocating motion used in honing also serves to maintain a uniform rate of grit and bond fracture and a uniform number of sharp cutting tip contacts. Frequent changes in speed and direction of motion facilitate this self-dressing action.

The simplest form of multi-directional abrasive actuation used in conventional honing is shown diagrammatically in Fig. 5. This combines a simple rotating movement with simultaneous reciprocating strokes, generating a simple, harmonic abrasive travel path. As shown, the ratio is slightly more than two revolutions

Fig. 5. Honing Tool Rotation Combined with Simultaneous Reciprocation, in the Ratio of 2 to 1, Generates the Simple Harmonic Abrasive Travel Paths Shown



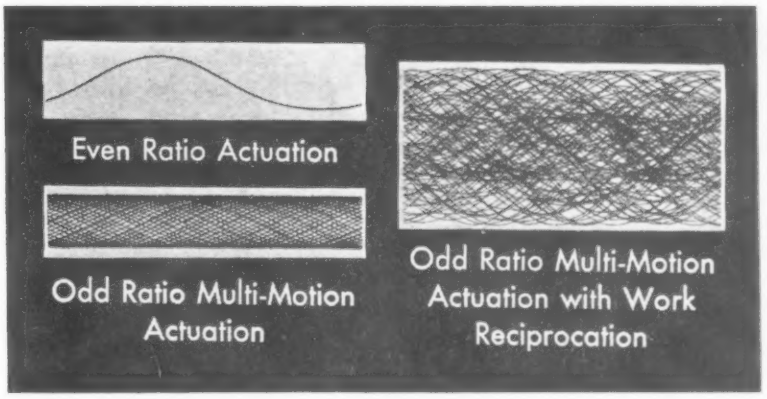


Fig. 6. Partially Traced Travel Paths of a Single Abrasive Grit on the Work Surface for Various Motions of the Honing Tool and Work

to one reciprocation. In actual practice, this ratio varies with the length of the part, so that no stone will duplicate its path of travel until the entire surface has been covered.

Representations of partially traced travel paths of a single abrasive grit on the work surface for various motions are shown in Fig. 6. By reciprocating the work in a direction parallel with the axis of the tool, in addition to rotating and reciprocating the tool, a pattern such as that shown at the right can be obtained.

A honing stroke is the movement of the tool in either direction of spindle travel. The stroke must include over-travel at each end, in order to allow the tool to revolve in these positions and generate straight and round surfaces without bell-mouth. The amount of over-travel may vary from one-quarter to one-half the length of the stone. The dressing action of the ends of the surface being honed helps to keep the grits sharp.

The honing sticks are so actuated as to overlap their previous positions at the end of each stroke. The paths of a number of sticks, positioned symmetrically around the periphery of the hone, will cross each other many times during an operation. Since the angle of cross-hatch can be adjusted through a wide range, and the abrasive grains fracture at a fairly uniform rate, it is virtually impossible for a grit to cut a continuous spiral or to follow in any of its former paths. Generally speaking, the included angle between the helix of strokes made in opposite directions should be somewhere between 40 and 90 degrees.

Straight-line honing is sometimes employed after regular honing to remove cross-hatch or other surface patterns resulting from simultaneous rotation and reciprocation of the tool. This process consists of a full reciprocating travel, with no rotation except an automatic, intermittent indexing at the end of each reciprocation. The indexing is arranged so that the abrasive will not travel more than once in the same track.

Materials and Parts that Can be Honed

Practically any material can be honed. All metallic materials, including hard and soft cast iron, steel, carbides, brass, bronze, aluminum, silver, etc., and many non-metallic materials, such as glass, certain plastics, and ceramics, have been honed. Some plastics and certain other materials in which the stringy structure will clog ordinary stones must be honed with specially treated or resinoid-bonded abrasives.

Parts can be of any shape, as long as the surface to be honed is cylindrical. The surface to be honed can be interrupted by ports, undercuts, keyways, or other openings, provided such openings are bridged by the abrasive stones or guides. Tapered bores can be honed by the use of special equipment and tools. Bores from 1/4 inch to 42 inches in diameter and parts from 1/8 inch to 72 feet long have been honed. The only dimensional limit is the size of machine that can be economically produced.

To hone to the bottom of a blind hole or to a shoulder, it is necessary to have a slight recess or under-cut a few thousandths of an inch larger than the bore. Some parts with very short bores are stacked in shuttles for honing, as will be described in the next installment.

Surface Preparation for Honing

No special surface preparation is required for honing. The quality of the surface produced by the preceding operation does not affect the finish

created by honing. In fact, when hard materials are being honed, a rough surface makes the abrasive cut more effectively. The surface to be honed must be accurately located by preceding operations in order to obtain consistent results. When bore inaccuracies such as out-of-roundness or taper are known to exist, about twice as much stock should be left for honing as the amount of the known error. A rough-boring or reaming operation to locate the hole and remove excessive stock is all that is necessary to prepare the hole for honing.

On parts that are to be honed for finish only, just enough metal should be left for honing, so that all the tool marks will be removed. In general, from 0.0002 to 0.001 inch on the diameter is sufficient for such finish-honing operations. When honing is done primarily to remove stock, it is often more economical to perform two operations—a rough-honing to remove most of the stock, and a finishing operation to produce the desired finish.

In some parts that are to be hardened, the most economical procedure is to hone the parts both before and after heat-treatment, in order to develop an accurately sized, round, and straight bore. Prior to heat-treating, stock up to 0.030 inch on the diameter is quickly honed from rough-bored holes or from those that have been reamed in screw machines. After heat-treating, the bore is finish-honed to correct any minor distortion caused by the hardening operation and to produce the desired finish.

Several gear manufacturers have adopted this method of honing. The gear blank is taken from the automatic screw machine and the bore is honed. The part is then pressed on an arbor, locating it from the accurately sized, round bore, and the teeth are cut on its periphery. This insures concentricity of the bore with relation to the pitch diameter of the teeth. After heat-treating, the bore of the gear is finish-honed. During finish-honing, the gear is placed in a floating fixture and about 0.003 inch is removed from the bore diameter. The gear centers itself on the honing tool, so that location of its bore with relation to the teeth is not changed.

Selection of Abrasive Stones

Honing stones consist of aluminum oxide, silicon carbide, or diamond abrasive grits, held together in stick form by a vitrified clay, resinoid, or metal bond. Stone life has been increased as much as 1500 per cent, compared with that of pre-war stones, by careful control of the abrasive manufacturing process, the mesh or abrasive grit size used in each stick, and the methods of applying the stones to the surface being honed.

The porosity or structure of the stick depends on the mixture of grit and bond and the method used in forming the stick. The degree of porosity affects the cutting action by aiding or interfering with chip clearance. The bond of the abrasive is treated, sometimes by "fills" of wax, sulphur, resin, or other material, to control the cutting action and increase the life.

"Harzlite," an abrasive bond treatment developed by the Micromatic Hone Corporation, comprises an additive substance deposited and hardened on the bond and bond posts which anchor the abrasive grains. This treatment permits the use of a free-cutting vitrified bonded stone of soft grade, which, if used without treatment, would have excessive wear. Treated stones used in honing a cast-iron Diesel engine sleeve, 8 1/8 inches in diameter by 42 inches long, removing 0.008 inch of stock on the diameter, produced eighteen to twenty bores per set of stones compared with five to six bores obtained with untreated stones.

The length of the stick is made about one-half the bore length, if possible. Low spots in the surface being honed are thus bridged and the high spots sheared first. The length and rigidity of such stones permit them to straighten a bowed bore rather than to become bowed themselves.

The grain and grade of abrasive to be used in any particular honing operation depend upon the quality of finish desired, the amount of stock to be removed, the material being honed, and other factors.

The following general rules may be followed in the application of abrasive for honing:

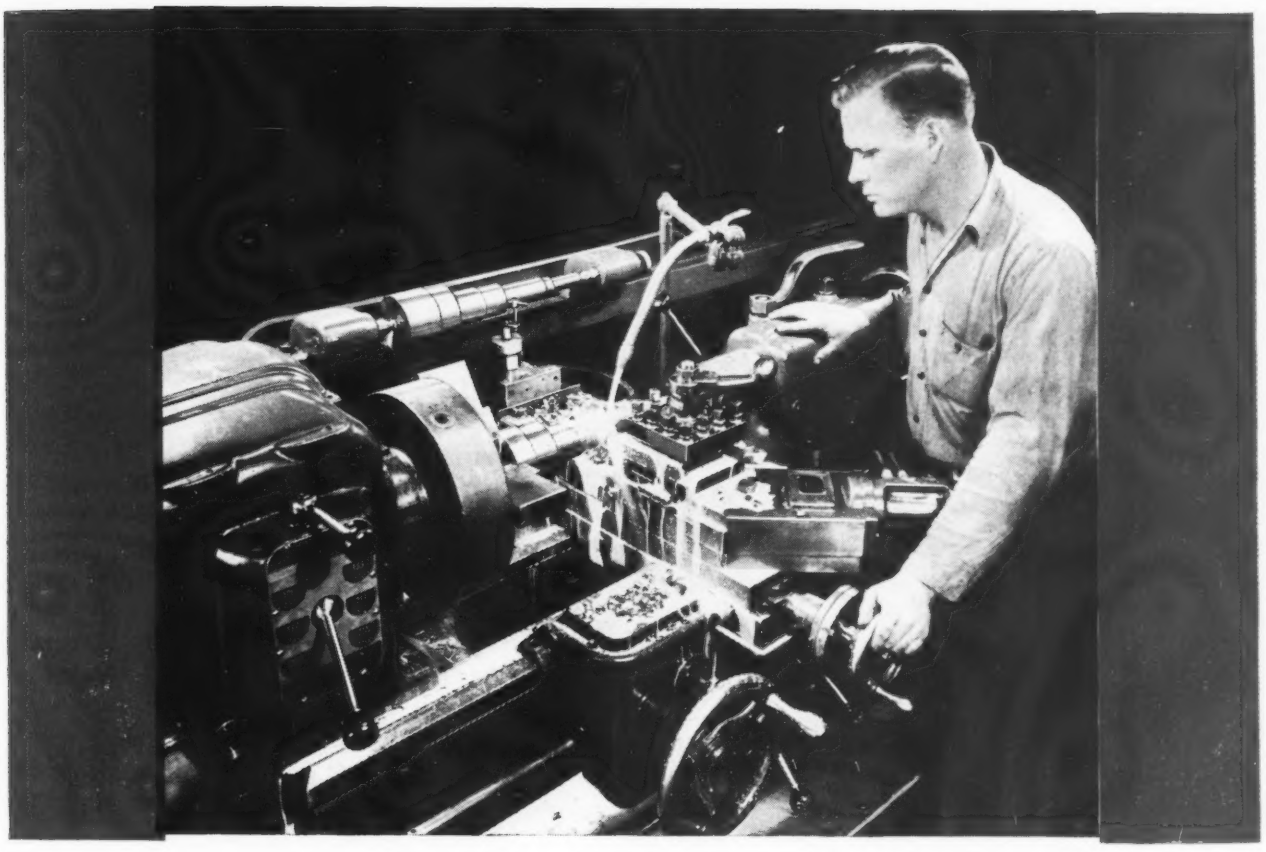
1. Silicon-carbide abrasive is commonly used for honing cast iron, while aluminum-oxide abrasive is generally used on steel.

2. The harder the material being honed, the softer the abrasive stick used.

3. A rapid reciprocating speed will tend to make the abrasive cut fast because the dressing action on the grits will be severe.

4. To improve the finish, use a finer abrasive grit, incorporate more multi-direction action, allow more "run-out" time after honing to size, or increase the speed of rotation.

Shaft Duplicating in Single-Tool Lathe Operations



Cylindrical Work is being Accurately Reproduced at High Production Rates on Lathes Equipped with a Finish-Turned Part or Templet and a Hydraulically Controlled Single Cutting Tool

SUBSTANTIAL savings are being effected in the production of cylindrical shafts by means of tracer-controlled single-tool lathe operations. Filling the gap between the manufacture of a comparatively few parts on ordinary engine or tool-room lathes and mass production of similar parts on multiple-tool automatic lathes, this method introduces a relatively new technique in the art of turning metal. Typical applications of the hydraulic shaft-duplicating lathe made by The American Tool Works Co., Cincinnati, Ohio, are described in the following.

This lathe is designed to reproduce cylindrical shafts from a templet—preferably a finish-turned shaft—by means of a hydraulically controlled cutting tool. Multiple-diameter, contour, or tapered shafts with chamfers, right-angle shoulders, recesses, or fillets can be reproduced accurately at high production rates. Set-ups and change-overs can be made in from fifteen to thirty minutes.

The tool-slide operates at an angle of 45 degrees with the axis of the work. This compensates for the continuous longitudinal movement of the carriage when cutting square shoulders, rounded corners, or chamfers. Only on very large diameter flanges is it necessary to disengage the longitudinal feed and employ the cross-feed for facing cuts.

Production has been increased 60 per cent in

Fig. 1. Multiple-diameter Shaft (Right) Turned from 4 1/4-inch Steel Bar Stock in Eighteen Minutes by Means of the Set-up Shown in the Heading Illustration

turning the multiple-diameter shaft seen in the heading illustration. This shaft for the quick-return movement of a radial drilling machine is produced from S A E 4145 steel bar stock, 4 1/4 inches in diameter, as shown at the left in Fig. 1.

A finish-turned shaft is used as a templet, being held between adjustable centers mounted on supports at the rear of the lathe. A tracer point, in contact with the templet, controls the movement of the cutting tool in reproducing the shaft.

The shafts are turned at a cutting speed of 300 surface feet per minute, using a 3/8-inch depth of cut and a feed of 0.015 inch per revolution. Each shaft is completely machined, ready for grinding, in eighteen minutes. This includes the 2 1/2 minutes required to reverse the shaft in the chuck for finish-turning and facing the large-diameter end.

Hydraulic equipment on this type lathe consists of a motor-driven pump which supplies hydraulic oil under a pressure of 300 pounds per square inch to a tracer valve. Mounted on this valve is a hardened steel stylus, the ball tracing point of which has about the same radius as the nose on the finishing tool. Metered amounts of oil from the tracer valve enter a hydraulic cylinder attached to the tool-slide and thus control the movement of the cutting tool. Short, flexible hydraulic connections between the metering valve

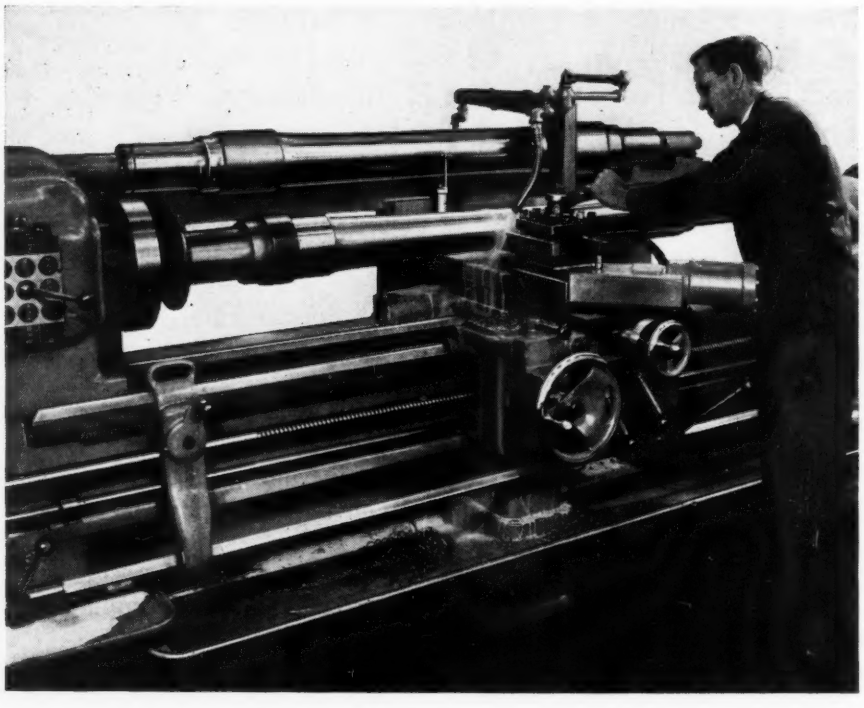


Fig. 2. A Railroad Passenger Car Axle is Reproduced with the Equipment Shown in Fifty Minutes. With Conventional Turning Methods, This Operation Required 210 Minutes

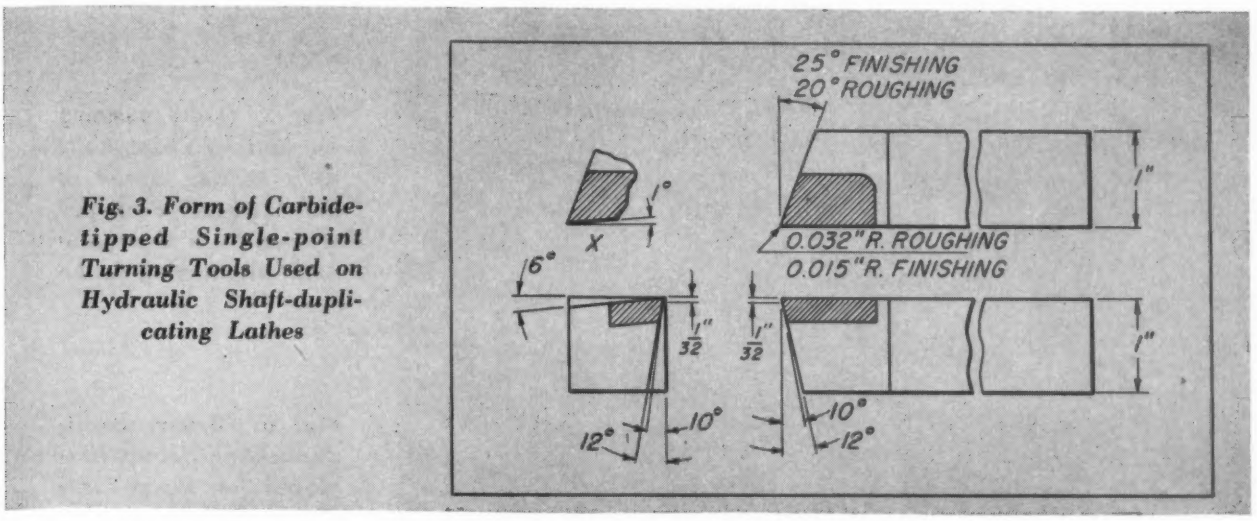


Fig. 3. Form of Carbide-tipped Single-point Turning Tools Used on Hydraulic Shaft-duplicating Lathes

and the actuating piston insure a positive displacement of the fluid.

When the tracing stylus is traversing a straight section of the templet, the balance of the hydraulic pressure in the valve is undisturbed, and the tool-slide is locked in position by an equal amount of pressure on both sides of the actuating piston. When the stylus encounters a change in the shape of the templet, more or less oil is permitted to flow to one side or the other of the tool-slide actuating piston.

The tracing valve is mounted on an independent slide, the movement of which is controlled by a handwheel and micrometer dial located at the right of the tool-slide. Depth of cut can be varied by moving the tracer-valve slide, thus changing the location of the stylus point with relation to the cutting tool. A manually controlled lever is provided for quick advance and retraction of the tool-slide by hydraulic power. Nitrided ways and neoprene wipers are provided on the tool-slide to minimize wear.

A railroad passenger car axle forging, 86 1/2 inches long by 7 9/16 inches in diameter, is shown being turned in Fig. 2. This axle, which previously required 210 minutes to machine, is

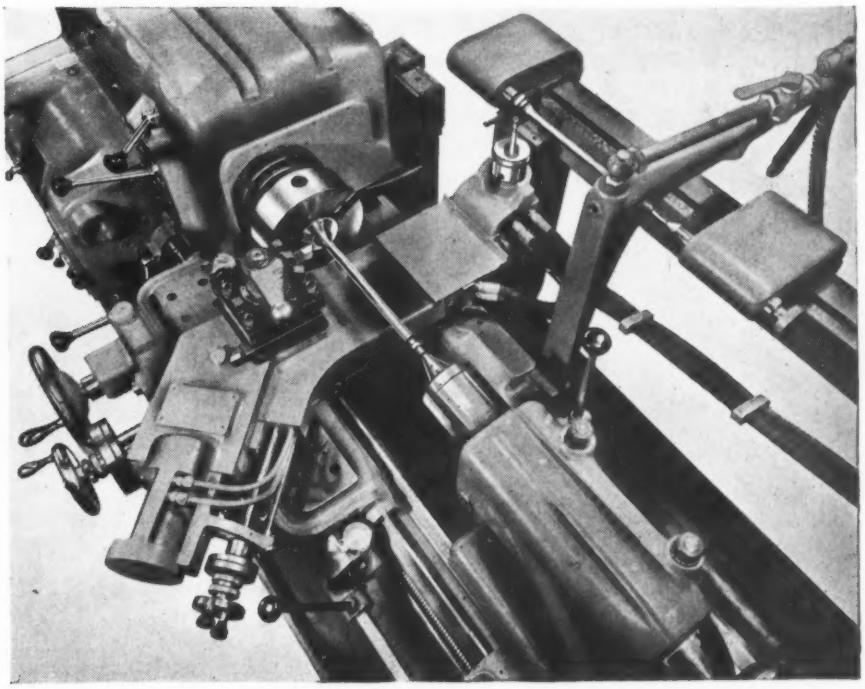


Fig. 4. Using a Workpiece as a Templet, Both the Head and Stem of This Large Diesel-engine Valve are Machined in Thirteen Minutes on a Shaft-duplicating Lathe

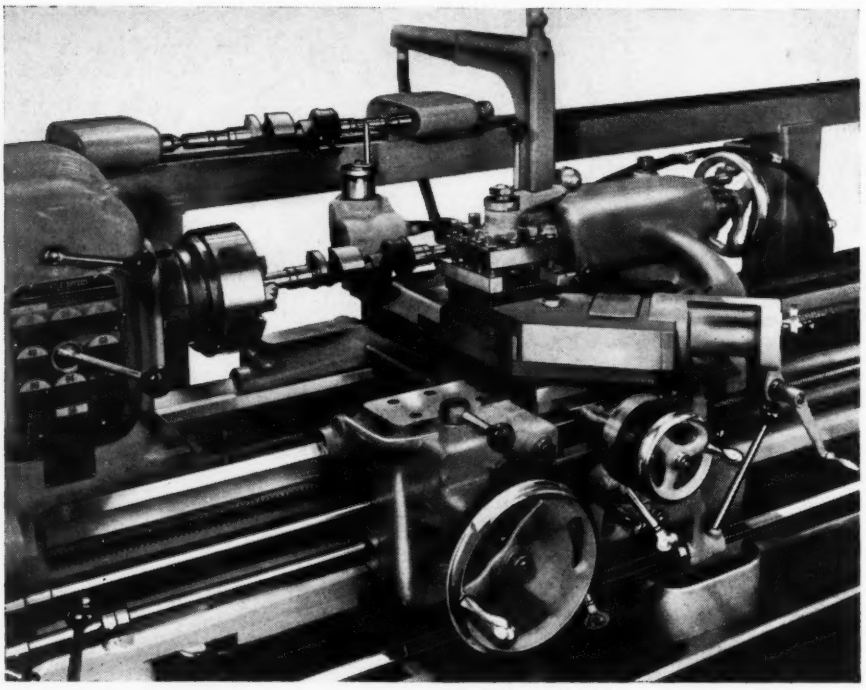


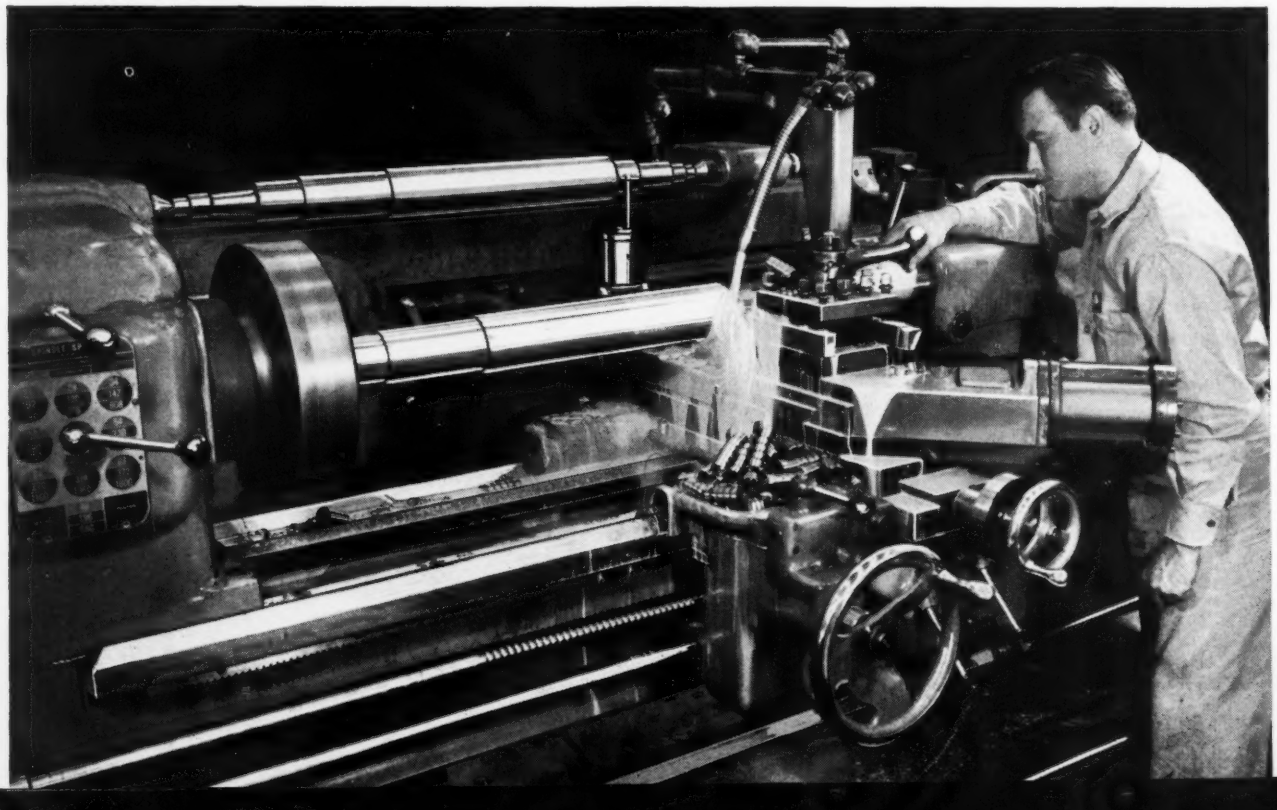
Fig. 5. (Left) Turning the Ends of Crankshafts at a Cutting Speed of 350 Surface Feet per Minute on a Hydraulic Shaft-duplicating Lathe

Fig. 6. (Below) Shaft-duplicating Set-up Employed for Rough-turning before and Finish-turning after Heat-treatment of Work

now being finish-machined all over in fifty minutes. The cutting speed on this job is 350 surface feet per minute, the depth of cut 1/8 inch, and the feed 0.015 inch per revolution.

Since a finishing cut only is required in this operation, two finishing tools are mounted in the four-way tool-block. One tool can be removed for sharpening while the other is in operation. Ordinarily, both a roughing and finishing tool are mounted in the block. It is only necessary in such cases to swing the desired tool into the cutting position and begin the operation without resetting.

Carbide-tipped single-point tools, ground to the form shown in Fig. 3, are used for practically all turning jobs on the hydraulic shaft-duplicating lathe. In addition to a smaller nose radius and larger end cutting-edge angle, the finishing tool is generally provided with a 1-degree side cutting-edge angle, as shown at *X*. In all cases, the finishing tool is set 1/64 inch to the left of and 1/32 inch deeper than the cut-



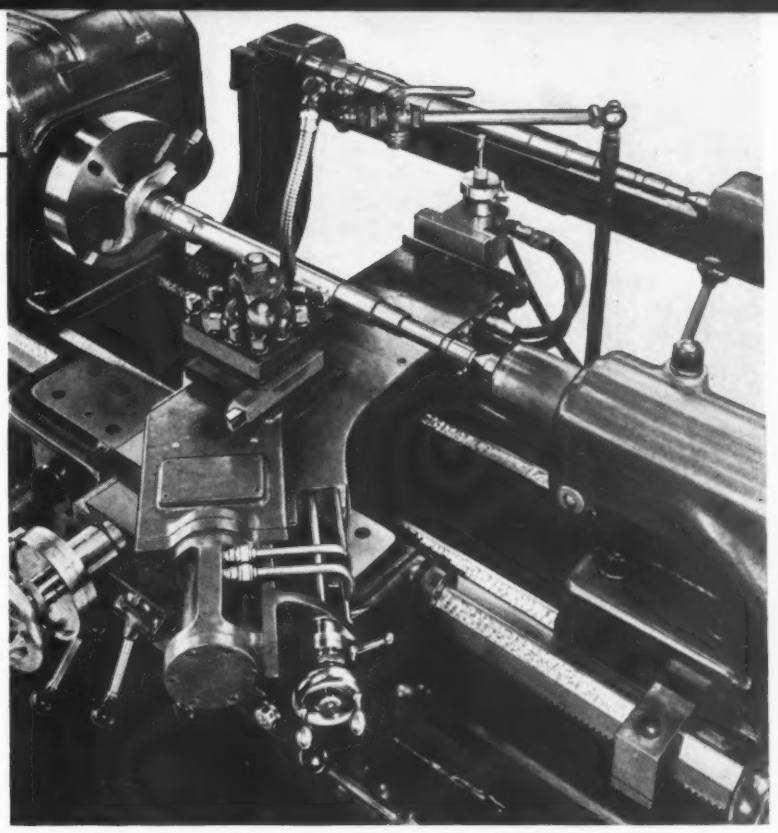


Fig. 7. This Multiple-diameter Steel Shaft is Rough- and Finish-turned in 16 1/2 Minutes at a Cutting Speed of 300 Surface Feet per Minute

ting position of the roughing tool. In this way, no change in dial settings is required when changing from roughing to finishing. On operations thus far, tool life between sharpenings has averaged four hours for roughing tools and eight hours for finishing tools.

Both the head and stem of large Diesel-engine valves are reproduced from a work-piece master by means of the set-up shown in Fig. 4. With a cutting speed of 100 to 500 surface feet per minute and a feed of 0.007 inch per revolution, one valve is completely machined every thirteen minutes.

The ends of S A E 4140 steel crankshafts are rough- and finish-turned, as shown in Fig. 5, at the rate of 3 1/4 minutes per shaft. The shafts are rotated at a surface speed of 350 feet per minute, and the tools are fed 0.015 inch per revolution.

The long traction motor-shaft shown being machined in Fig. 6 is rough-turned before heat-treatment and finish-machined in the same set-up afterward. In the rough-turning operation, the tool is fed to a depth of 1/2 inch in the S A E 4150 steel bar, and traversed at the rate of 0.020 inch per revolution. The cutting speed is 190 surface feet per minute. Both ends of the shaft are rough-turned in about twenty-three minutes.

After heat-treating, the shaft is finish-turned with a 1/32-inch depth of cut and a feed of 0.020 inch per revolution. Each shaft is finish-machined in about seventeen minutes.

The multiple-diameter shaft seen being machined in Fig. 7 is finish-turned in three cuts, requiring only 16 1/2 minutes per shaft. First, a roughing cut is taken the entire length of the part. The second roughing cut is taken over about one-half the length. Then, all diameters are finish-turned by guiding the tool with the work-piece templet. The S A E 1045 steel shaft is rotated at a surface speed of 300 feet per minute, and the tool is fed at 0.016 inch per revolution.

Since a finish-turned templet is generally more accurate and less costly than a flat templet, it is preferred for most shaft-duplicating operations. When very long templets are employed, adjustable supports can be used to maintain parallelism. Alignment between the center lines of the templet and work is kept within 0.0005 inch.

Design and Application of Carbide-Tipped "All-Depth" Drills

By FRED W. LUCHT, Development Engineer*
Carboloy Company, Inc., Detroit, Mich.

"ALL-DEPTH" carbide drills have generally been referred to as "gun drills" because they resemble in shape the drills used on gun barrels. Although many have been employed for this purpose, neither gun drilling nor deep-hole drilling describes adequately the broad uses of these carbide-tipped drills.

Drills of this type are being employed because they enable high production rates to be obtained, permit higher feeds, and give long drill life between grinds. Their use is not confined to deep holes; in fact, these carbide drills perform even better on shallow holes. They maintain their accuracy and produce smooth holes with a minimum of runout. With such drills, large holes can be drilled from the solid instead of having to remove material by several successive drilling operations, and deep holes can be drilled without withdrawing the drill to clear the chips.

Types of All-Depth Drills

Carbide-tipped all-depth drills may be divided into two general types—the solid carbide type shown in Fig. 1, and the wear-strip type illustrated in Figs. 2 and 3. In the first type, the entire drill end is made from solid carbide, and is generally limited in size to about 1/4 to 5/8 inch in diameter. The end is copper-brazed to a steel body or shank.

The wear-strip type of drill is made with one carbide cutting tip and two carbide wear strips. One wear strip is located 90 degrees behind the cutting edge, and the other 183 degrees behind the cutting edge. The brazed type wear-strip drills (Fig. 2) are generally made from 0.290 to 1 inch in diameter. The wear-strip type drill shown in Fig. 3 has the advantage of easier handling, particularly during drill sharpening, since the drill end is detachable. These drills are made in sizes from 1 inch to about 3 inches in diameter. A straight tungsten grade of carbide is generally employed for both types of drills. If the operating conditions warrant it, a more wear-resistant grade can be used.

General Design Considerations

The outside diameter of all-depth carbide drills is ground cylindrical with a back taper of 0.0006 inch per inch. After the outside diameter has been ground, a longitudinal clearance is ground along the cutting tip, leaving a circular land below the cutting edge. This land *J*, Figs. 2 and 3, varies in width from 0.030 inch for a 0.290-inch diameter drill to 0.050 inch for a 3-inch drill. The outside diameter of the steel bodies for wear-strip type drills is made about 2 per cent smaller than the drill size. The cutting edge on such drills should always be either on center or up to 0.003 inch below center, never above center, to produce a free cutting action.

In attaching carbide drill ends to the drill tubes, either of two silver solder brazing methods can be used. With one method, Fig. 4, the shank end of the drill is turned down to fit inside the drill tube. The V-shaped wall in the drill tube is milled out to receive the shank end. This method maintains alignment, and brazing provides a strong joint. With the second method, Fig. 5, the shank end of the drill is milled to a tongue shape having a 90-degree included angle. A groove also having a 90-degree included angle is milled across the drill tube. A fixture should be used with this method of brazing to maintain alignment of the drill end and the drill tube.

Cleanliness is of prime importance in performing the brazing operations. When new drill ends are brazed to used drill tubes, care should be taken to eliminate any oil seepage toward the brazed joint. All foreign material should be shaken out of the drill tube before the brazing operation. It is also advisable to plug the oil-hole at the shank end of the drill end with either

*Abstract of a paper presented before the Hartford Chapter of the Society of Carbide Engineers.

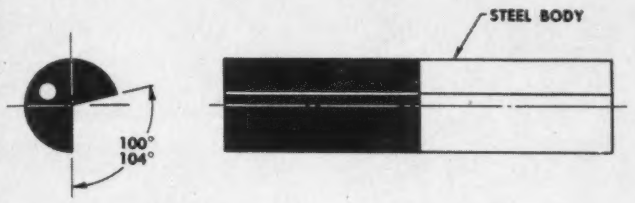


FIG.1
SOLID CARBIDE TYPE

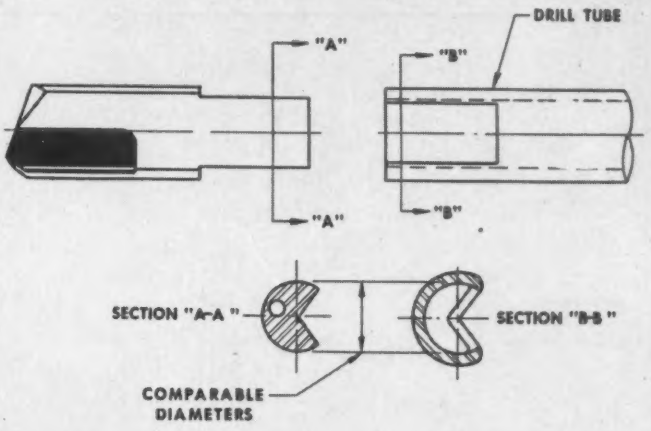


FIG. 4

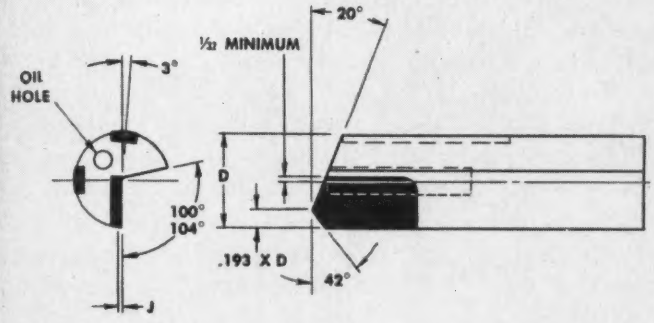


FIG.2
WEAR STRIP—BRAZED TYPE

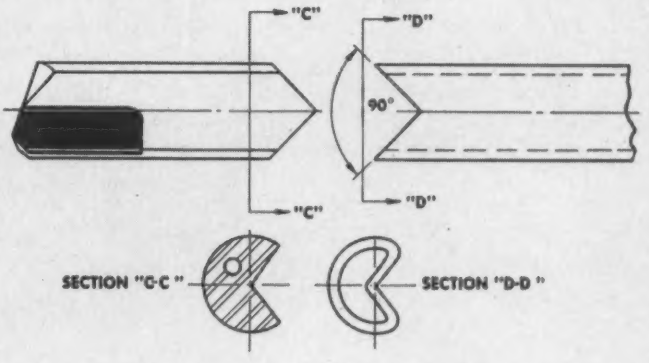


FIG. 5

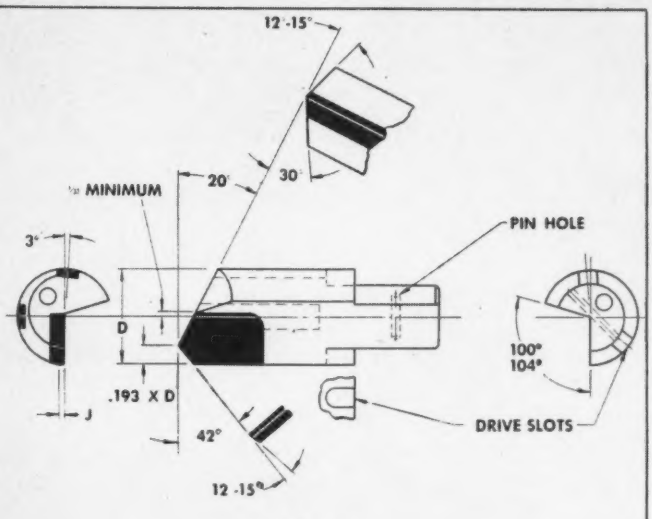


FIG. 3
WEAR STRIP
DETACHABLE TYPE

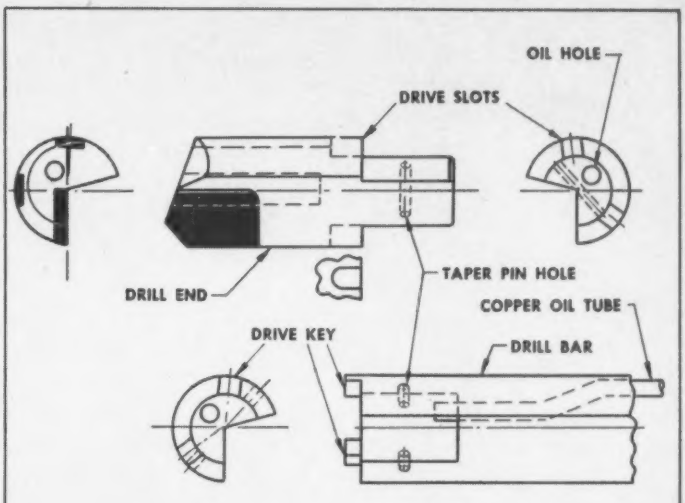


FIG. 6

soft wood or cork to prevent any possibility of the brazing material filling the oil-hole. The wood or cork will char, and can be shaken out at the drill end after brazing. The entire drill-tube periphery should be cleaned by grinding at the brazed joint.

It is good practice to locate the cutting face side of the drill flute in the drill end about 1/64 inch ahead of the corresponding side of the flute in the drill tube or bar. This prevents the formation of a step to which chips might cling.

Fig. 6 shows a wear-strip detachable type drill and the mating socket in a Pratt & Whitney drill bar. The drill is driven by the two keys shown. The only purpose of the taper pin is to hold the drill head in place while the assembly is withdrawn from the hole. A copper oil-carrying tube, which runs the full length of the drill bar, projects into a counterbore in the oil-hole provided in the shank end of the drill.

Grinding of All-Depth Drills

A drill ground to the specifications shown in Fig. 7 will be satisfactory for most drilling operations. All grinding should be done free-hand, on the same type of grinding machine used for carbide-tipped single-point tools. In rough-grinding the 42-degree outer cutting angle, the drill should be held firmly by hand in a V-block, which is swung at a 42-degree angle, with the grinder table tilted at a 12- to 15-degree angle. During this operation, the drill should be rotated about its own axis to produce the 12- to 15-degree eccentric clearance angle.

The 20-degree inner cutting angle is ground in the same way, with the cutting tip face kept parallel with the top of the grinder table. The drill point should be located at a distance equal to 0.193 times the drill diameter from the outside diameter of the drill. A 60-grit silicon-carbide cup type wheel is recommended for these operations.

Finish-grinding of both the 42- and 20-degree angles at an 8-degree relief angle may be done in the same or similar fixtures. The land below the cutting edge should be about 1/32 inch wide. A 100- to 150-grit diamond cup type wheel is recommended for finish-grinding to produce a keen cutting edge. A light hand feed of about 6 inches per minute should be used for the final pass along the grinding wheel. It has also been found that lapping of the cutting edge with a 220- or 240-grit diamond wheel improves the operating condition on some jobs. The steel drill body should be ground away at a 30-degree angle above the cutting edge and behind the drill flute with a 46-grit aluminum-oxide wheel.

Sharpening should be done only on the end of the drill; the face of the cutting tip should never be touched. Every drill should be inspected after finish-grinding to determine if there is any possibility of rubbing of the drill at the end portion. The sharp edges of the wear strips should be rounded to prevent scoring of the drilled hole, and the oil-hole should be cleared of all burrs that might restrict the flow of the cutting fluid.

An all-depth drill should not be allowed to become too dull. A sharp drill always produces the straightest holes. Minimum trouble and a maximum number of holes per drill are obtained if the drill is resharpened after drilling a definite number of holes.

Best results are obtained at present with carbide all-depth drills when used on regular gun-drilling machines, since these are designed for the use of stationary type drills. However, a pressure gage should be attached to the drill feeding slide to determine whether the oil pressure is high enough to maintain a uniform feed.

The all-depth drill is self-guiding in the work, its usual tendency being to follow the general direction in which it has been started. Therefore, the drill guide bushing shown at the left in Fig. 8 in the combination drill guide and work support is one of the most important parts of a drill set-up. This bushing should be hardened and ground, and should run freely in an anti-friction bearing.

For best results, the drill should be guided through the three bushings and fed into the work while the work is rotating at the correct cutting speed. The guide bushings should be checked for accuracy with a plug gage at frequent intervals. The bushing shown at the left is forced against the work-piece under spring pressure and thus revolves with the work. This helps to get the drill started properly. Wooden wedges are driven into the stationary guide bushings to dampen drill vibrations.

Cutting Fluids Recommended

A cutting fluid serves four main purposes when used with carbide-tipped all-depth drills: (1) It removes the drill chips; (2) it lubricates

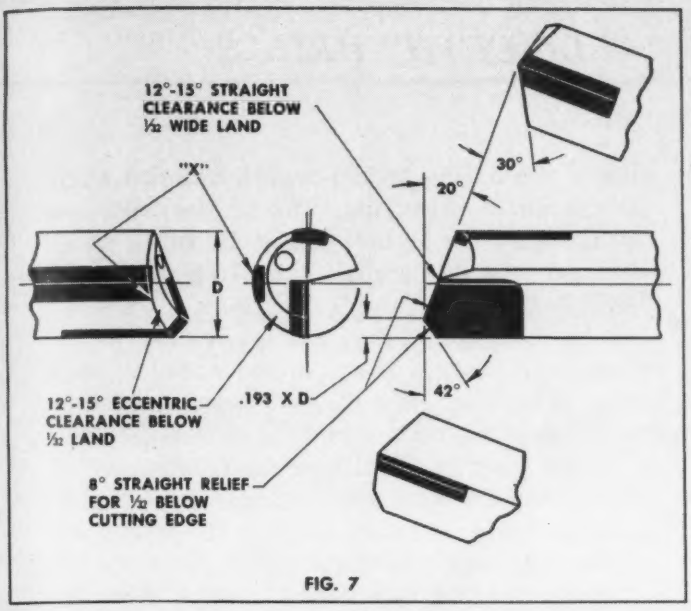


FIG. 7

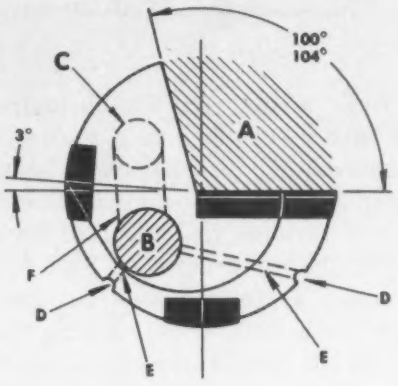


FIG. 10

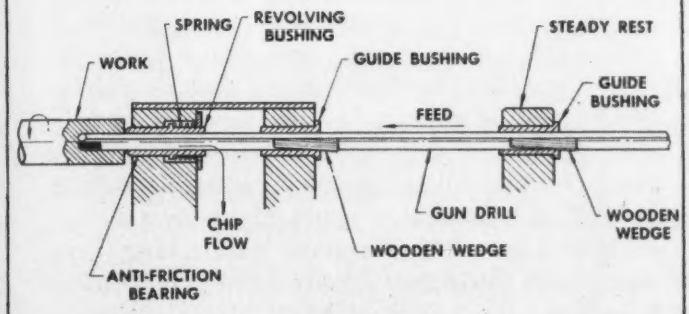


FIG. 8

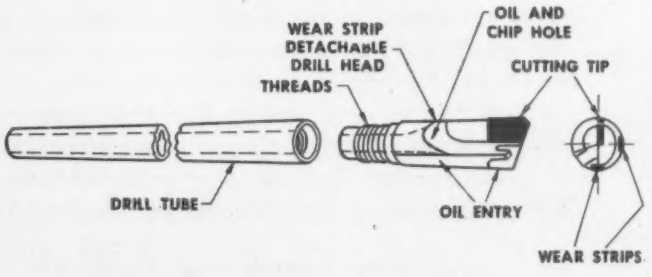


FIG. 11

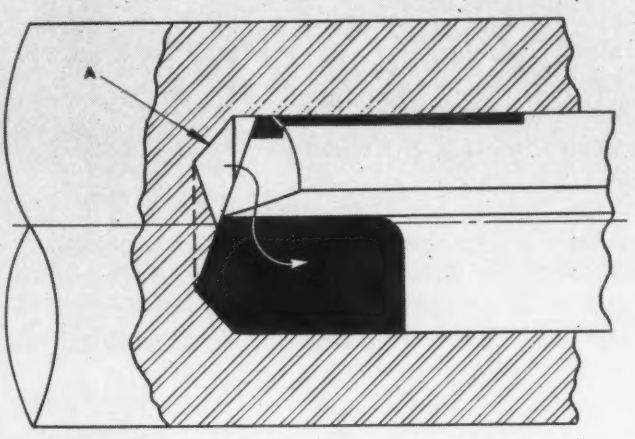


FIG. 9

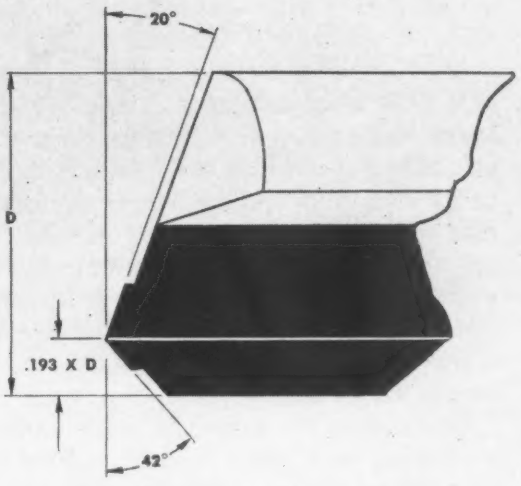


FIG. 12

the wear strips; (3) it lubricates the cutting edge; and (4) it acts as a coolant.

Removal of the drill chips is the most important factor. The fluid is forced under high pressure through the length of the drill into the annular-shaped groove *A*, Fig. 9, produced by the drill. It then passes out through the V-shaped drill flute, thus washing the light chips through the flute to the open end of the hole.

The oil pressure should be high enough to keep the chips flowing continuously away from the cut. Working range of oil pressures for various carbide drilling jobs varies between 300 and 800 pounds per square inch. The oil pressure for a given job varies with the drill size, depth of the drilled hole, and rate of feed. If the chip flow is intermittent, or if the chips are packed together in a shape conforming to the drill flute cross-section, this is usually an indication that the oil flow is too low, and pressure should be increased at once.

Both soluble and cutting oils have been used, but a sulphur-base cutting oil is preferred because a smooth, resilient chip is formed, which has a minimum tendency to pack in the drill flute.

Cutting Speeds and Feeds

Experience in cutting steel with these drills indicates that the work being drilled should be rotated at a cutting speed ranging between 130 and 350 surface feet per minute. It is suggested that a new job be started at from 200 to 250 surface feet per minute and that the speed be varied until a satisfactory balance between drill life and feed rate is obtained.

Most of the gun-drilling type machines available have been designed primarily to cover the lower end of this speed range. Since it is not considered good practice to run any machine tool at its maximum speed for long periods of time, many gun-drilling jobs in which carbide tools are used have actually been operating at too low a cutting speed. Although a slightly longer drill life may thus be obtained, full advantage is not taken of carbide tooling because the cutting speeds are below the most economical range.

Practically all gun-drill work thus far has been done with feeds of from 0.0006 to 0.0036 inch per revolution. For all-depth drills to function properly at high feeds, the rate of oil flow must be sufficient to eliminate the tendency for the chips to pack in the drill flute. It is advisable to use a 100- to 104-degree included angle for the flute. Also, the ratio of the cross-sectional area of the oil-hole *B*, Fig. 10, to the cross-sectional area of the drill flute *A* should not be less than 1 to 4.3.

It has been found that wear strips last longer if small oil-grooves *D* are milled ahead of each strip. The shank end of the grooves should be connected to the main oil-hole *B* by a drilled hole *E*. This permits a uniform distribution of oil in front of each wear strip. Frequently, an additional oil-hole *C* is drilled through the steel body. In this case, both oil-holes *B* and *C* are connected to an enlarged oil-hole in the back of the drill.

Rotary All-Depth Drills

Frequently the question is asked if carbide-tipped all-depth drills can be rotated instead of revolving the work, particularly where the work is irregular or too large and heavy to be revolved readily. Indications are that long drills should not be rotated because of their unsymmetrical shape and small cross-section, which tends to set up an unbalanced condition resulting in drill chatter and a rapid breakdown of the cutting edge. This becomes particularly pronounced at the higher speeds. It may be feasible to rotate a short drill, however. In this case, an alternate design of drill, as shown in Fig. 11, may be used. The cutting angles would be comparable to those of the stationary drills; however, the chips would be carried out through the center of the drill instead of along an external flute. The cutting oil, in this case, flows to the cut through a longitudinal flattened opening along the periphery of the drill and returns through the center, carrying the chips.

Other Operating Conditions to be Considered

Indications are that when all-depth drills approach a diameter of 2 1/2 inches, it is necessary to break the broad chip which comes from both the 20- and the 42-degree cutting angles. Steps ground in the cutting edges, as shown in Fig. 12, will do this effectively.

A small change in the relationship between the 42-degree outer cutting angle and the 20-degree inner cutting angle will change the amount of side pressure in either direction. Such change will also aid in breaking up the chips flowing from the drill.

Killing the Goose that Lays the Golden Egg

STRIKES and rumors of strikes are once again threatening to upset American industry, with harmful effects on every individual in the land. Increases in wages that may be won through coming strikes will most assuredly be passed on to the defenseless consumer because of the fact that most corporations are not operating with sufficient profits to absorb greatly increased labor and material costs. You and I, and that includes the workers who will carry home bigger pay envelopes if the strikes are successful, are bound to pay—in even greater living costs than at present.

Prices for many commodities have already reached such heights that the general public can no longer afford to buy the things they need and want. People with fixed incomes, especially, and thousands upon thousands of salaried workers find themselves pinched economically. Manufacturers have viewed reductions in orders with some alarm, and as a result, have voluntarily reduced prices on steel, household appliances, and other things. Increases in wages will necessitate bringing back the higher prices.

Higher costs, added to the already pyramided prices for homes, automobiles, clothing, etc., will lead to still further inflation of our economy or else to a business depression that will be largely due to the inability of the consumer to buy commodities other than the necessities of life. A recent survey has shown that a healthy majority of workers, even of union members, think present wages are fair and that they prefer reasonable wages, with future security, rather than higher wages with less security. But labor leaders apparently see only the immediate prestige accruing to themselves through victories in labor-management disputes. For the sake of present advantages, they appear willing to sacrifice a prosperous and secure future for their own men.

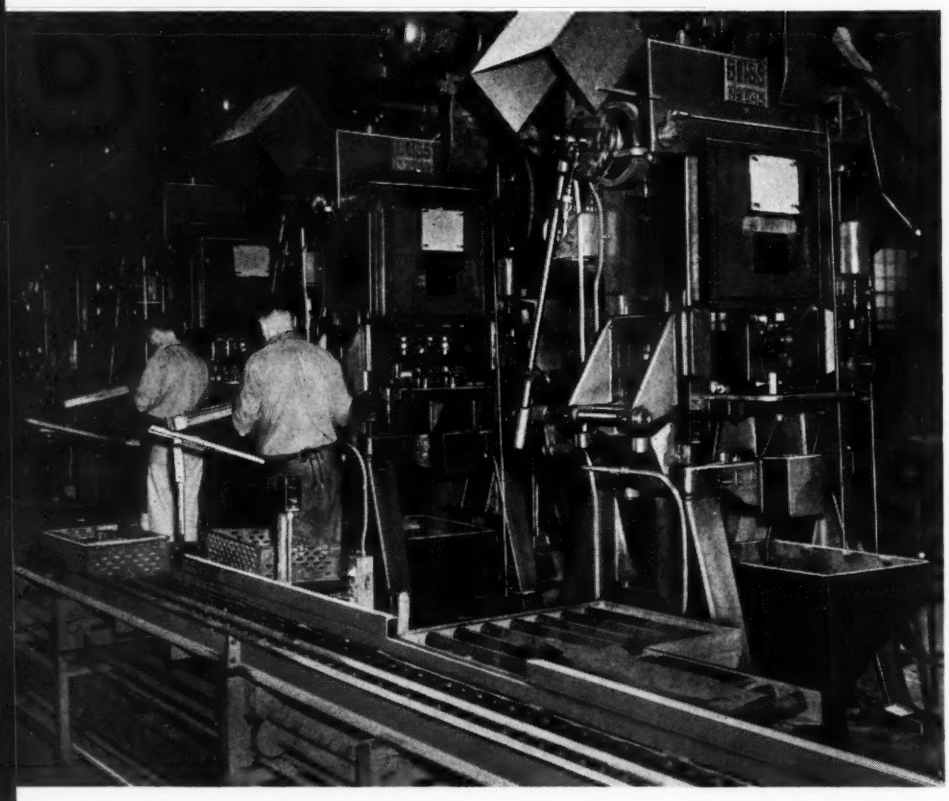
In other words, labor leaders seem willing to kill the goose that lays the golden egg. The general public is in the unhappy position of being that goose, because it is the public that supplies the money to buy the products of most industries and that is the principal sufferer in paying higher prices with the same or reduced income.

Some day the general public will protest sufficiently (probably through their representatives in Congress) to call a halt to the paralysis of the American way of life through the complete stoppage of transportation, utility services, and often entire sections of industry.

Charles O. Herb

EDITOR

Efficient Handling of Work and



Efficient Lay-Out and Adequate Material-Handling Equipment at the Danville, Ill., Plant of the General Electric Co. Enable Automatic Presses to be Operated at Maximum Speeds

By
VALLORY H. LAUGHNER

THE highest possible output from automatic presses often depends on the handling equipment employed to carry the material to the machines and to transport the completed parts. Production bottlenecks in press shops are usually due to inadequate facilities for handling the work and the scrap.

Efficient work-handling equipment is a feature of the new General Electric plant at Danville, Ill., which was built for producing fluorescent lamp ballasts; these ballasts are used to limit the current to the lamps and, in the larger sizes, to increase the line voltage to the point at which the lamps will start. The press shop makes lamination punchings for the transformer and reactor coils, as well as cases for the completed ballasts.

After ascertaining the quantities and types of laminations required for each ballast, the engineers who planned this factory determined on the number and types of presses required, the speed at which they should operate, and the type of scrap disposal and materials-handling equipment that would best suit the proposed production schedules. Conveyor lines were installed for carrying finished lamination punchings and formed sections to the heat-treating furnaces, handling scrap, storing roll stock before it goes to the presses, and storing parts awaiting heat-treatment.

Three groups of presses are arranged in straight-line formation. Lines 1 and 2 contain high-speed Bliss automatic presses, while line 3 is composed of 50-ton Henry & Wright dieing machines, and Bliss, Toledo, and Minster presses.

All of the presses in lines 1 and 2 are used to punch transformer laminations and wedges, either of E or L shape, as shown in Fig. 1. These machines have a standard stroke of 1 inch and an operating speed that can be varied between 100 and 300 strokes per minute, depending on the size and type of punching. They are normally run at 200 strokes per minute.

An important feature of these presses is their accessibility. When all machines are in operation, it is necessary to grind a die on the average of one every ten to fifteen minutes. Thus, reduction in handling and set-up time is an important factor in maintaining the production schedule.

The presses are equipped with a friction feed that operates from an eccentric on the driveshaft. The stock—electrical steel—is obtained in coils approximately 28 inches outside diameter and 16 inches inside diameter. Since the plant is highly specialized and each press is nor-

Scrap in Automatic Press Operations

mally used for only one size and type of punching, the stock is stored behind each press on roller conveyors. These conveyors are loaded by a lift-truck.

As needed, the coils are mounted on Littell stock reels, as shown in Fig. 2. As the strip is fed to the die, a paddle arm on the stock reel is raised or lowered, depending on the amount of slack in the strip. When this arm reaches a predetermined height, it actuates an electric switch that turns on the feed motor in the stock reel. Thus, the feed mechanism on the press pulls only the weight of the metal strip between the reel and the press, and not the weight of the entire reel.

Once in operation, these presses are fully automatic, the operator merely being required to stack the punched laminations in stainless-steel heating trays and re-feed the press after each roll is used. On most dies in use at this shop, two punchings come off the front of the die and two drop through the end. Scrap falls through the die on a vibrating conveyor which carries it to a belt conveyor at the end of the row of presses; from there, it is taken to scrap bins outside the building.

With the exception of the die for punching the L section, all dies are progressive in operation and of multiple design. Stock fed to the presses is the width of the laminations, so that the only scrap material is that punched from the center of the two sections. Some dies are scrapless units, the central rectangular pieces being employed in building up the transformer. A press using this type of die is shown in operation in Fig. 3.

To insure continuity of operation, dull dies are carried to and from the grinders by conveyors, and three dies are carried in stock for each press, two being held in reserve.

The presses in the third line are used for drawing and forming ballast cases from 0.031-inch No. 1010 S A E steel. This line consists of both upright and inclinable presses and dieing machines. The dieing machines are used to form and stamp small bases and clamps for the ballast cases. Automatic in operation, they are run at from 90 to 120 strokes per minute. Both scrap and finished parts slide from the dies to conveyor belts in front of the machines. This scrap is kept separate from that coming from the first two lines, since it has less salvage value than the electrical steel.

The inclinable presses, one of which is shown in Fig. 4, are used to draw the ballast cases and the larger bases. Four-stage, high-carbon, high-chromium steel dies are mounted in these machines to punch, pierce, draw, and trim the cases. The dies are so designed that scrap falls out at the bottom and the finished parts fall off the front. The stock is fed by hand to the presses from coils mounted on reels in back of the machines. Three sizes of cases are drawn on this and two similar presses; the cases are 1 3/16 inches deep, and vary only in length. On all dies, including those for forming, the part is stripped by air.

In some instances, because of the shortage of coil stock, it is necessary to use strip material on these machines. This is cut to size on a Cincinnati 10-foot shear and stacked on tables in back of the presses.

The output of both the semi-automatic and the fully automatic presses is increased considerably by the conveyor systems, since the speed of the presses is dependent upon the ability of the oper-

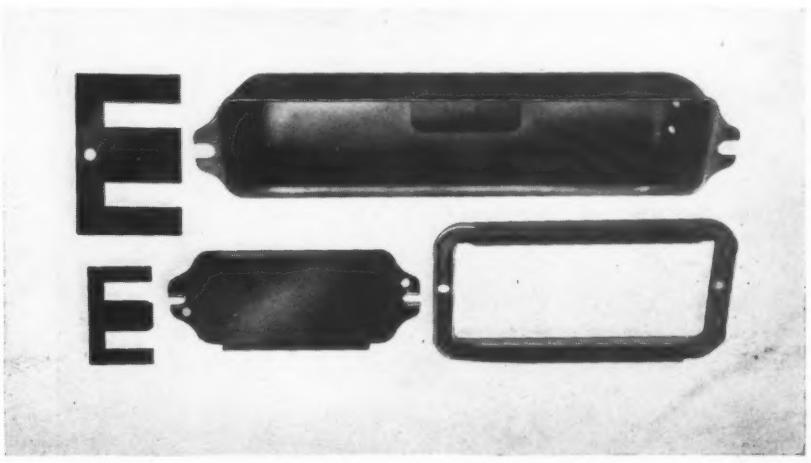


Fig. 1. (Left) Laminations Punched on Progressive Dies in Automatic High-speed Presses, and (Right) Parts Drawn or Formed on Inclinable Presses or Dieing Machines

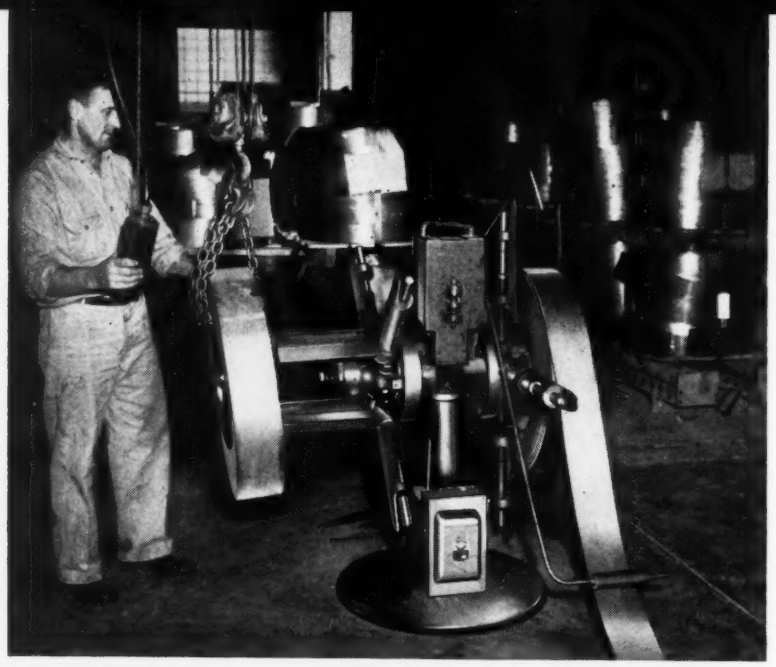


Fig. 2. Stock Reels are Used to Feed Strip Stock to the Automatic Presses. Reels of Equal Diameter are Employed for Feeding Stock to Multiple Dies

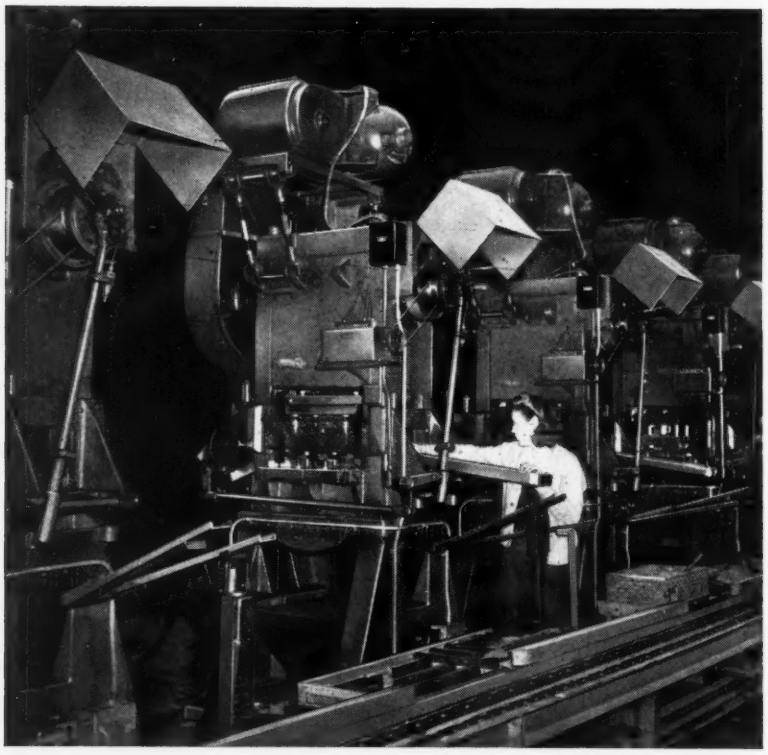


Fig. 3. A Scrapless Die is in Use on the Bliss Automatic Presses Here Illustrated. Note the Three Discharge Chutes—Two for the E Sections and One for Straight Punchings

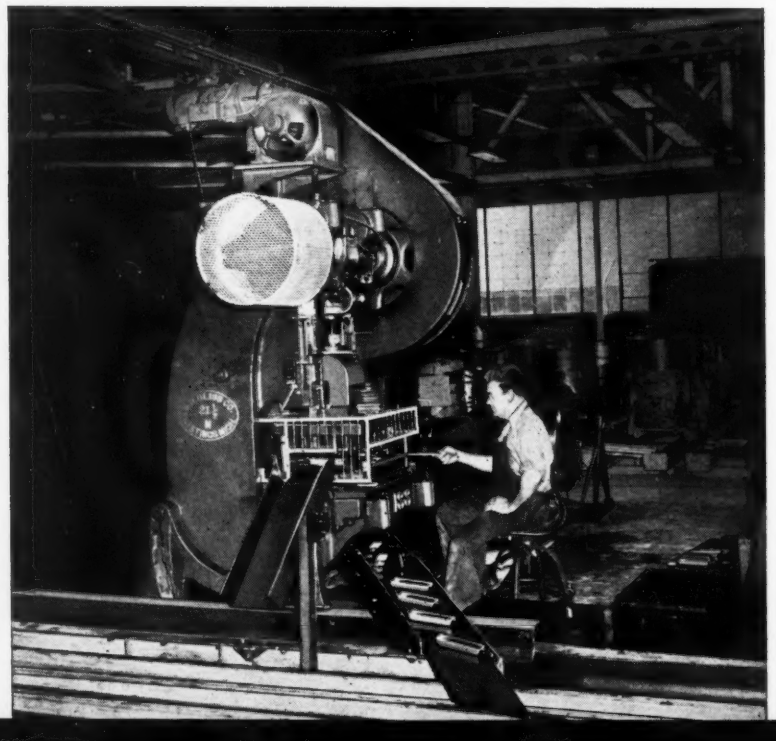


Fig. 4. This Inclinable Press is Used to Draw Mild Steel Cases 1 3/16 Inches Deep. It is Hand Fed, Equipped with a Four-stage Progressive Die, and Operates at About 90 Strokes per Minute

ator to handle the finished parts. Chain conveyors carry parts directly from lines 1 and 2 to the heat-treating furnaces, while belt conveyors handle the output of the semi-automatic units.

The conveyor system for the automatic presses is so arranged that trays with parts from line 1 are automatically loaded into the annealing furnaces. Limit switches control the loading of six trays per hour per furnace, at ten-minute intervals. During the time that the presses are in operation (two shifts per day), the output from line 2 is automatically stacked on storage conveyors. Since the furnaces are in operation continuously, the production from this line can be heat-treated during the third shift.

Punchings are heat-treated for two reasons—to relieve internal stresses and to form a thin coat of oxide on the surfaces for insulation purposes. In the first section of the furnaces, which are of the electrically heated, controlled-atmosphere type, the punchings are heated in air; in the second section, the temperature is increased and the excess oxide on the parts is removed by a reducing atmosphere; in the third section, the parts are cooled in a reducing atmosphere, after which they are carried through a Ferguson six-pass vertical air cooling tower, where they are cooled to room temperature.

From this point, the parts are taken to storage or to the assembly floor, and the empty annealing trays are carried back to the punch press room by overhead conveyor.

* * *

National Tool and Die Manufacturers Association's Conference

The fourth annual New England conference and dinner of the National Tool and Die Manufacturers Association was held at the Taft Hotel in New Haven, Conn., on May 14. Improved manufacturing methods, resulting in lowered unit costs, were illustrated by a display of parts produced by various types of dies, molds, jigs, and fixtures. The regional associations sponsoring the conference are the Southern New England Tool and Die Manufacturers Association, the Western Massachusetts Tool and Die Association, the Central Connecticut Tool and Die Association, and the Eastern Massachusetts Tool and Die Association. These four associations have a combined membership of 150 tool, die, mold, and machine shops, employing a total of 3000 toolmakers and machinists. The conference was addressed by Governor James C. Shannon of Connecticut, Mayor William C. Celentano of New Haven, and Colonel Herman Steinkraus.

New Safety Codes Announced by American Standards Association

A revised edition of the American Standard Safety Code for the Protection of Employes Using Power Presses and Foot and Hand Presses has been announced by the American Standards Association. The new code includes recommendations for the safe installation of power presses, as well as for a wide variety of guards and feeding methods for all types of power presses and foot and hand presses. It also makes recommendations for safe operating conditions.

A few fundamental principles are recommended as the basis for safe operation of power presses. These include the designing of dies to facilitate safe operation, efficient feeding and ejection methods, effective guarding at the point of operation, proper press maintenance, adequate operator training, and careful supervision.

The Association also announces the publication of a new edition of the American Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels. Because of an increase in the use of small mounted wheels and points, two new tables have been added to cover critical speeds for wheels and points using 3/32-inch spindles. Slightly higher speeds for dish wheels and saucer wheels are now permitted.

Copies of these standards can be obtained from the American Standards Association, 70 E. 45th St., New York 17, N. Y. The press code is available at $1.25 per copy, and the abrasive wheel code at 75 cents per copy.

* * *

New Protective Oil for Rust Prevention

A semi-permanent rust-preventive oil of extremely low viscosity, known as "Special Protective Oil," has been announced by Oakite Products, Inc., 22 Thames St., New York 6, N. Y. This oil imparts a film to ferrous surfaces that resists moisture, humidity, perspiration, residue, acid fumes, etc. It is said to disperse and displace water or moisture on metal surfaces. When rinsed parts are immersed in the oil, the water sinks to the bottom of the tank and thus prolongs the life of the solution.

The flash point of the new oil is 110 degrees F., open cup, and the specific gravity is 0.800 at 68 degrees F. Under certain conditions, improved results will be obtained by diluting the oil with mineral seal oil or mineral spirits. It may be used at room temperature, but not at temperatures exceeding 95 degrees F.

Profile Gage Problem

By RONALD WAKELEE

The gage problem presented by Henry R. Bowman on page 175 of the January, 1948, number of MACHINERY is similar to some of those that the writer has encountered in gage design. The following method of solution, which makes use of the formula for finding the length of chord of a circular segment in terms of the altitude and radius, may also be of interest.

Referring to the accompanying diagram, the problem is to find the center of an arc of given radius *pe* which will pass through point *a* and also be tangent to line *bd*. Point *a* is at a given horizontal distance from point *o;* line *bd* is at a given angle *D* with the horizontal; and point *d* is at a given vertical distance from point *o*.

The location of the center *p* of the arc is established by determining *ip* and *oi*. If construction lines are drawn as shown in the diagram, the derivation of the formulas for finding *ip* and *oi* can be found as follows:

$$cr = cd \sin D \quad (1)$$

$$cm = ca \cos D = od \cos D \quad (2)$$

$$rm = cm - cr \quad (3)$$

Hence

$$rm = od \cos D - cd \sin D \quad (4)$$

$$eg = rm = od \cos D - cd \sin D \quad (5)$$

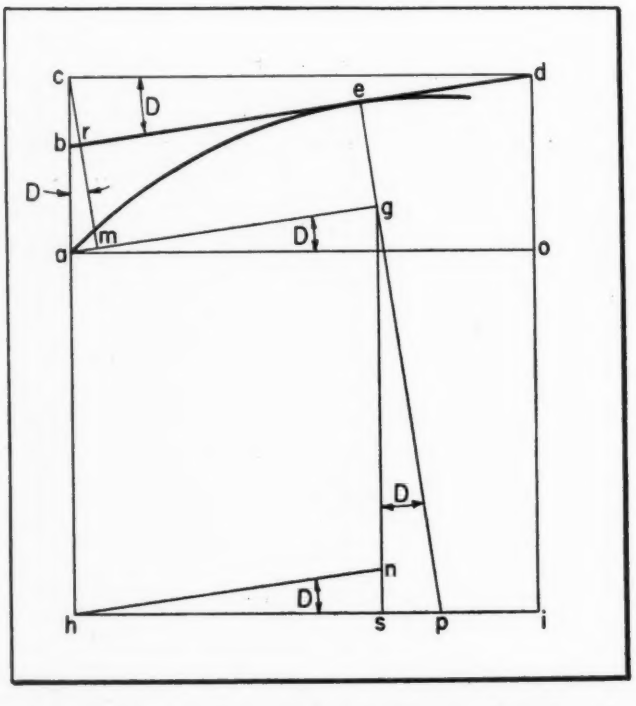


Diagram Used in Determining the Center of an Arc of Radius "pe" Passing through "a" and Tangent to "bd"

The formula for one-half the length of the chord of a circular segment in terms of the altitude and radius where *ag* = one-half the length of the chord; *eg* = the altitude; and *pe* = the radius, is:

$$ag = \sqrt{eg\ (2pe - eg)} \quad (6)$$

But

$$hn = ag = \sqrt{eg\ (2pe - eg)} \quad (7)$$

$$ip = hi - hp = cd - hp \quad (8)$$

and

$$hp = hs + sp \quad (9)$$

Hence

$$ip = hi - hs - sp = cd - hs - sp \quad (10)$$

But

$$hs = hn \cos D \quad (11)$$

Therefore

$$hs = \sqrt{eg\ (2pe - eg)} \cos D \quad (12)$$

$$sp = (pe - eg) \sin D \quad (13)$$

Hence

$$ip = cd - \sqrt{eg\ (2pe - eg)} \cos D - (pe - eg) \sin D \quad (14)$$

$$oi = ah = gs - ns \quad (15)$$

But

$$gs = (pe - eg) \cos D \quad (16)$$

and

$$ns = hn \sin D = \sqrt{eg\ (2pe - eg)} \sin D \quad (17)$$

Hence

$$oi = (pe - eg) \cos D - \sqrt{eg\ (2pe - eg)} \sin D \quad (18)$$

Example—Assume that point *d* is at a vertical distance of 2 11/16 inches from point *o;* point *a* is at a horizontal distance of 7 inches from point *o;* radius *pe* is 8 inches; and angle *D* is 10 degrees. Find *oi* and *ip*.

Solution—The following values are given: *od* = 2.6875; *cd* = 7; *pe* = 8; and *D* = 10 degrees. Then

$$eg = 2.6875 \cos 10 \text{ deg.} - 7 \sin 10 \text{ deg.} \quad (5)$$

$$eg = 2.6875 \times 0.98481 - 7 \times 0.17365$$

$$eg = 1.43113$$

$$ip = 7 - \sqrt{1.43113\ (2 \times 8 - 1.43113)} \times \cos 10 \text{ deg.} - (8 - 1.43113) \sin 10 \text{ deg.} \quad (14)$$

$$ip = 7 - (\sqrt{20.84995} \times 0.98481) - (6.56887 \times 0.17365)$$

$$ip = 7 - 4.49681 - 1.14068 = 1.3625 \text{ inches}$$

$$oi = (8 - 1.43113) \cos 10 \text{ degrees} - \sqrt{1.43113\ (2 \times 8 - 1.43113)} \sin 10 \text{ deg.} \quad (18)$$

$$oi = (6.56887 \times 0.98481) - \sqrt{20.84995} \times 0.17365$$

$$oi = 6.46909 - 0.79292 = 5.6762 \text{ inches}$$

* * *

Heliarc Welding of Irregular Shapes

Welding of the edges of an irregular-shaped stainless-steel container by applying the Heliarc shielded-arc welding process is shown in the accompanying illustration. The outline of the container is traced from a templet, as seen at the left center of the illustration, by using an Oxweld machine equipped with a magnetic tracing head. The stainless-steel sheet from which the container is made is 0.032 inch thick. High-frequency stabilized alternating current of approximately 50 amperes is used. The arc is shielded with argon gas which is supplied at the rate of 2 1/2 liters per minute. The welding time per container is fifty seconds.

* * *

A true indication of the purchasing power of United States currency can be found in recent statistics published by the Department of Labor. Since 1913 weekly earnings of factory workers have jumped from an average of $11 to more than $50, while the real wages, based on what a dollar will buy, have increased from $11 to approximately $22.

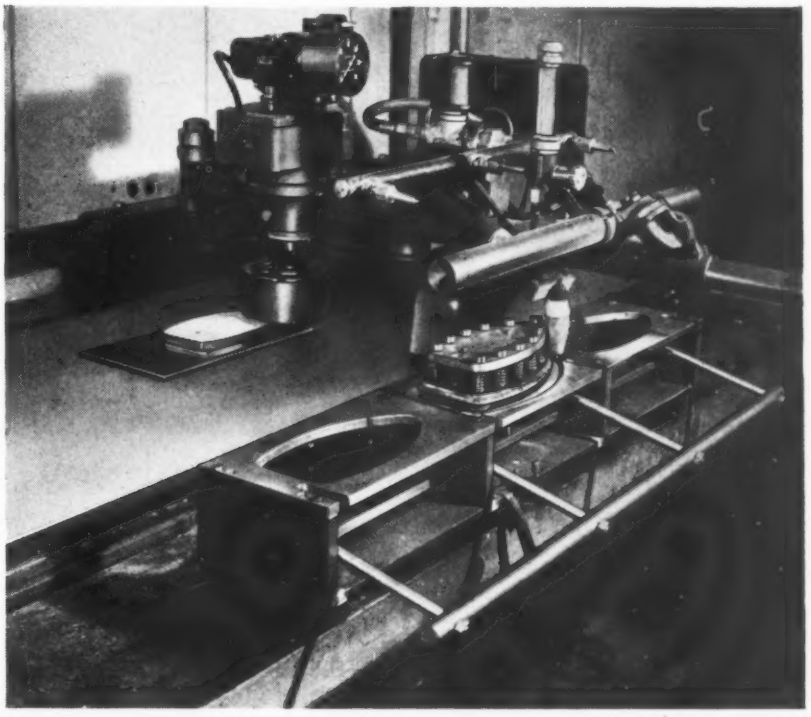
Compressed Air in Action

The Committee on Engineering Education of the Compressed Air and Gas Institute has prepared a thirty-minute illustrated lecture on compressed air power and its industrial application, designed primarily as a teaching aid to engineering schools and colleges. The lecture, entitled "Compressed Air in Action," may be illustrated by either a 35-millimeter continuous strip film, or by 2- by 2-inch film slides.

The purpose of the lecture is to illustrate and describe modern basic types of air compressing equipment and air-operated tools and to portray compressed air power in operation. It is available at cost to industrial organizations, technical societies, schools, foremen's clubs, and other interested groups. Further information can be obtained from the Committee on Engineering Education, Compressed Air and Gas Institute, Terminal Tower Bldg., Cleveland 13, Ohio.

* * *

Based on preliminary figures published by the United States Department of Commerce, estimated shipments of semi-finished aluminum products by United States fabricators during 1947 were approximately 925,000 tons, compared with 765,000 tons in 1946—the previous top peacetime year—or an increase of more than 20 per cent. Of the total 1947 shipments, approximately 1,400,000,000 pounds were in the form of wrought products and 450,000,000 pounds in the form of castings.



Automatic Edge Welding of an Irregular-shaped Stainless-steel Container by the Use of the Heliarc Shielded-arc Process

Making Wide

Methods and Machinery Employed by the Simonds Saw and Steel Co., Fitchburg,

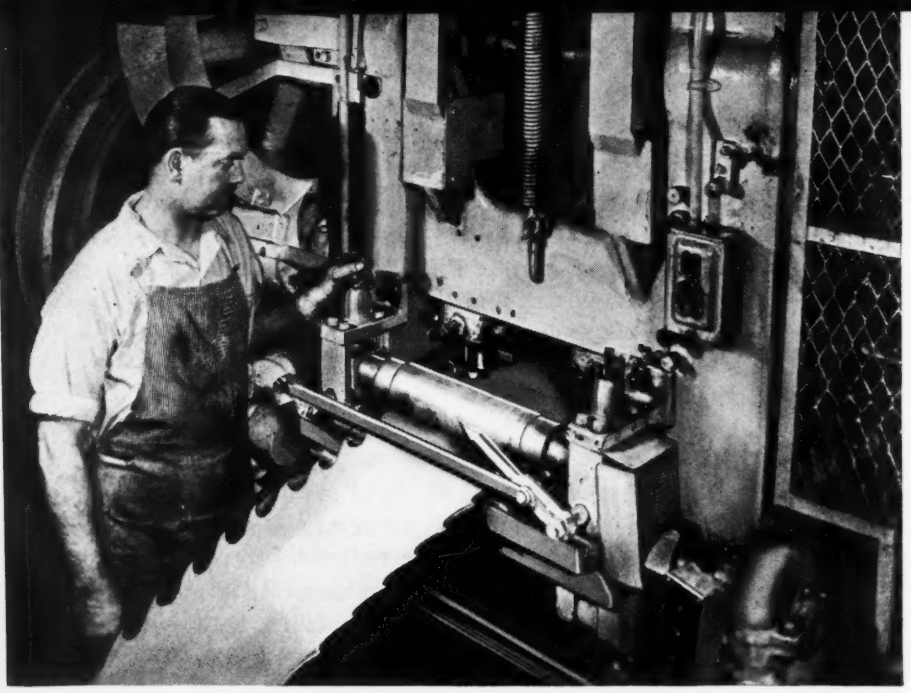
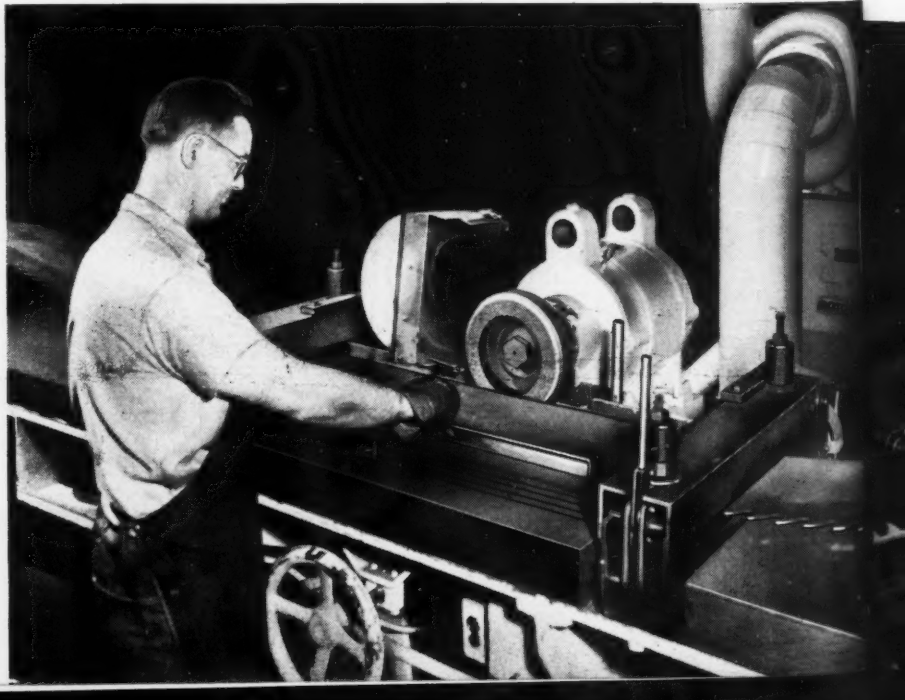


Fig. 1. (Upper Left) Saw Teeth are Punched in a Specially Designed Automatic Geared Press. Because of Different Tooth Pitches Encountered on Double-edged Saws, Each Side is Punched Separately

Fig. 2. (Center) The Strip is Cut to Length in a Small Shearing Press. The End may be Sheared Straight across or at an Angle as Illustrated, the Cut being Made on the Back of a Tooth

Fig. 3. (Lower Left) Saws from 7 to 17 Inches in Width are Welded by the Atomic Hydrogen Process; Smaller Sizes are Butt-welded. Some Saws are Brazed, when Specified by Customer

Fig. 4. (Lower Right) Squaring up the Back of a Single-edged Saw is Done on Grinding Machines Similar to the One Shown. This Operation Insures that the Tooth Edge and Back Edge will be Parallel



Band Saws

Mass., in Manufacturing Wide Band Saws for Use in the Logging Industry

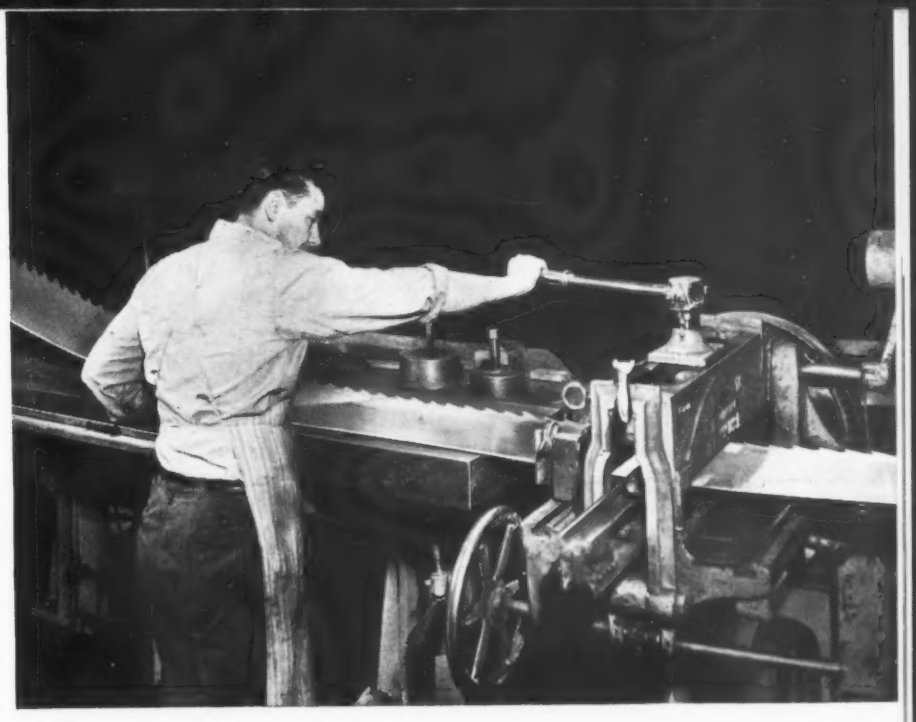


Fig. 5. (Upper Right) Tensioning of the Saw Band is Performed by Running it between Pressure Rolls until the Back Assumes a Crowned Shape. This is Necessary to Counteract the Centrifugal Forces Met with in Service

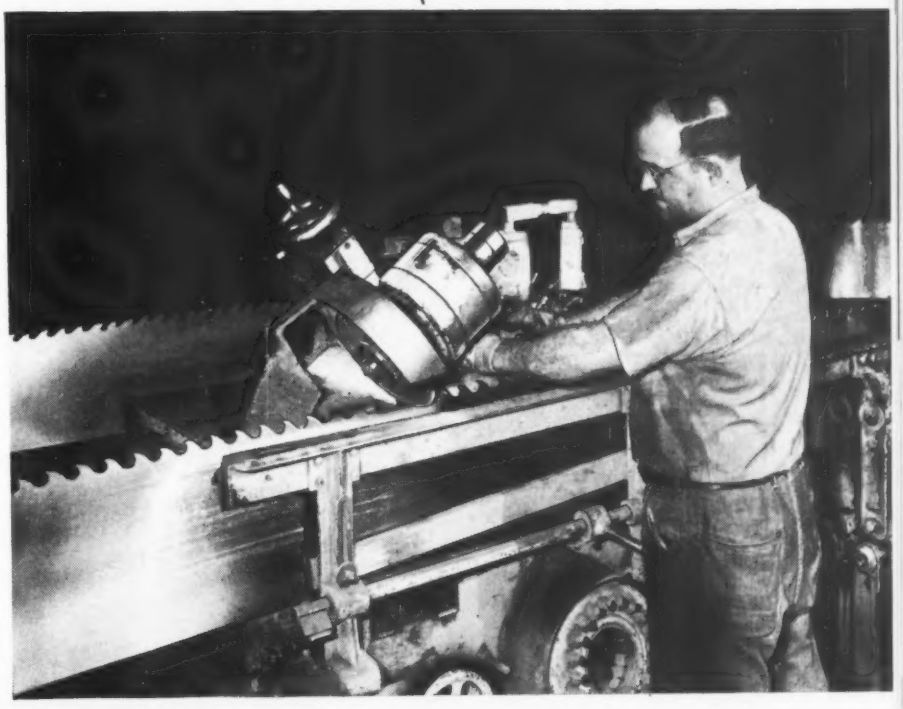


Fig. 6. (Center) The Saw Teeth are Ground Both before and after Swaging on a Grinding Machine that Automatically Indexes the Band past the Grinding Head. The Head Oscillates, Grinding Both Face and Back of the Teeth

Fig. 7. (Lower Left) Swaging the Points of the Teeth into a Flat Wedge that is Wider than the Material in the Band Provides the Necessary Clearance for the Saw when it is in Use. Thus the Teeth Need not be Offset

Fig. 8. (Lower Right) The Saw is Stiffened in an Electric Tempering Furnace to Prevent it from Flexing when Making a Cut

Engineering News

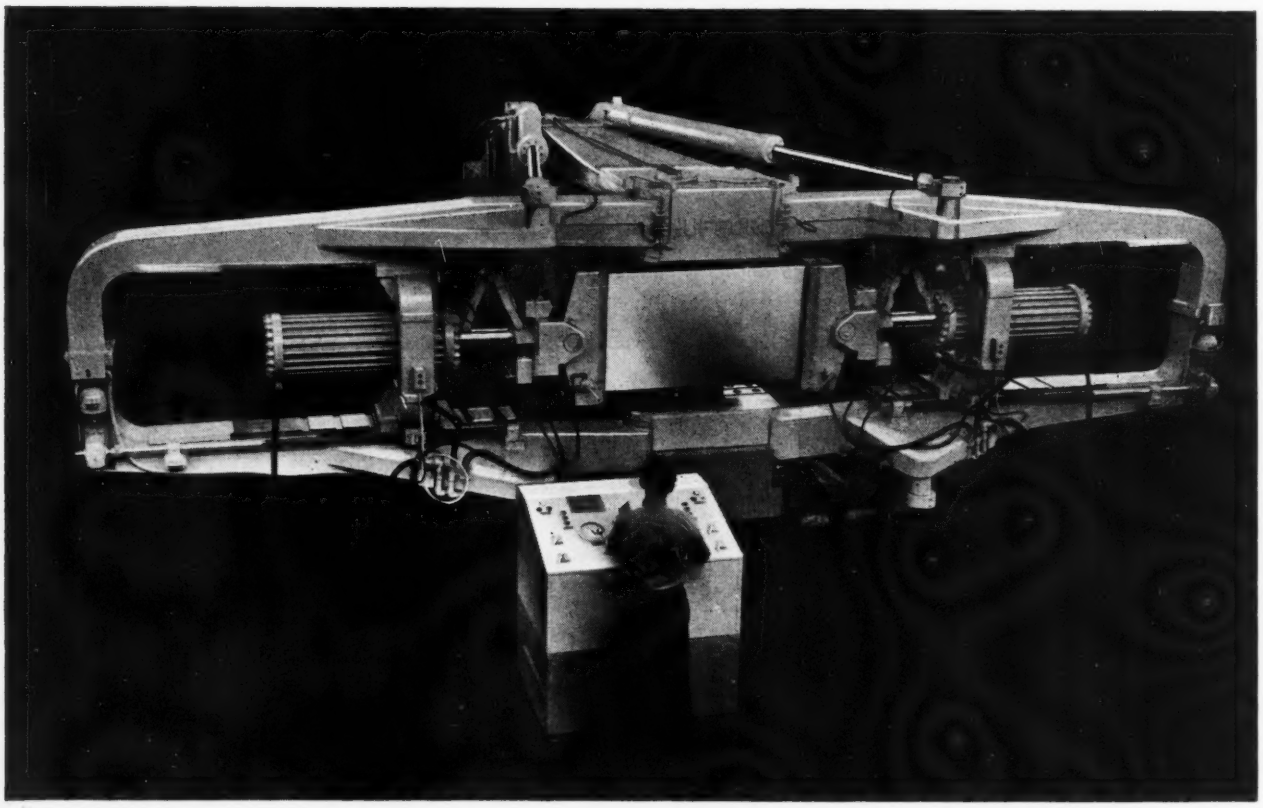
A Photo-Electric Eye that Permits Accurate Color Matching

A scientific color "brain," accurate to within one-half of 1 per cent, has been developed in the research laboratories of the Pittsburgh Plate Glass Co., Pittsburgh 22, Pa. The new "Color Eye" photo-electrically records the response, sensitivity, and discrimination characteristics of the human eye. With great accuracy, it measures color differences and divides the differences by the total reflected light to give comparisons in terms of percentage reflectance difference, regardless of illumination level or color density.

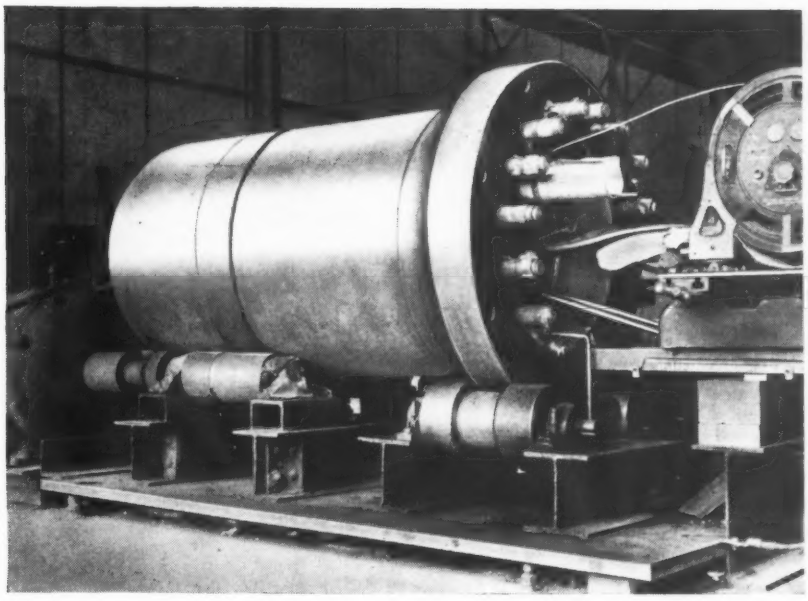
The normal sample area view of the instrument is 1/2 inch in diameter, but samples from 1 inch to several feet in size can be accommodated. Color differences are read directly on a meter having two ranges. Approximate luminosity is read on a logarithmic scale ranging from 0.1 to 100 per cent. The "Color Eye," which is adaptable to many industrial applications, will be marketed by Instrument Development Laboratories, Inc., Williston Park, Long Island, N. Y.

Huge Stretch-Forming Machine for Airplane Fuselage Sections

For stretch-forming operations on the various sections of airplane fuselages, North American Aviation, Inc., Los Angeles, Calif., has installed a new Hufford stretcher that was designed and built to meet specifications drawn up by their engineers. This new machine has two jaws, each of which is capable of exerting a 50-ton pull on a metal sheet. It can be adapted to many jobs previously done by drop-hammers and other stretching and forming machines. In the Hufford stretcher, the aluminum sheet is prestretched before being pulled over the die—an improvement over the former method of stretching the sheet while it is being formed. The new



As the Forming Operation on an Airplane Fuselage Section Starts, the Hufford Stretching Machine Stretches the Aluminum Sheet before Pulling it over the Die. The Jaws Bend the Sheet around the Die as the Machine Completes the Cycle. They are then Released and Return to Their Original Starting Position



A Welding Head, Mounted on a Counterbalanced Extension Arm, is Fed Inside a Rotating Hydraulic-press Cylinder for Repairing the Cylinder Bore

method results in more even stretching of the sheet stock, and consequently produces a part of more uniform strength and of greater accuracy; by this procedure spring-back is reduced to a minimum.

Twelve-Foot Sailboat with One-Piece Plastic Hull

A sailboat weighing only 300 pounds, with a hull constructed of one piece of plastic, has recently been designed. The sailboat is 12 feet in length, and is said to be ten times as rugged as the average wooden boat of the same size, in addition to being only about half as heavy. It accommodates six persons. The one-piece plastic part was molded by General Electric Plastics Division, Pittsfield, Mass. Unusual strength was obtained by building up layers of glass fibers and a plastic resin and then curing by steam and pressure. The boat is a product of the Beetle Boat Co.

Large Cylinder Bore Relined by the Welding Process

When a cylinder of a 1000-ton hydraulic press recently failed because of wear, the bore was repaired at only one-fourth the cost of a new cylinder, by means of welding. A Unionmelt welding head was mounted on an extension arm, so that the head could be fed the full length of the cylinder. The cylinder, which has a bore 24 inches in diameter by 15 feet long, was placed on rolls driven through a reduction gear by a variable-speed electric motor, as shown in the accompanying illustration. The cylinder was rotated at a speed of 8 to 10 inches per minute, and the welding head was advanced manually a given distance after each revolution.

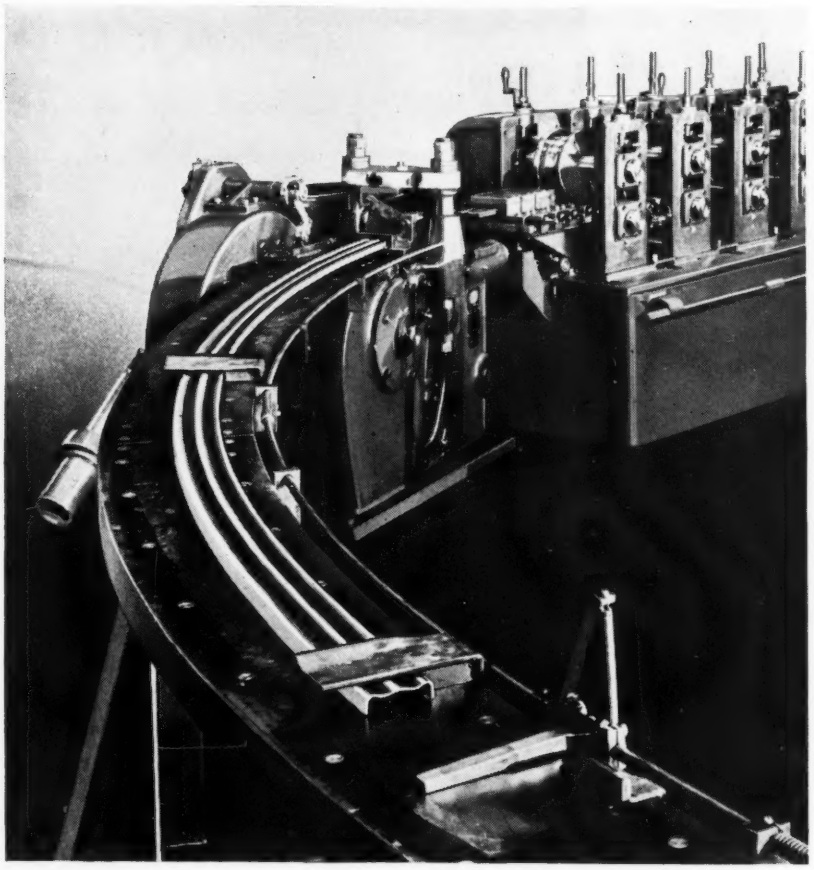
It was necessary to preheat the cylinder before welding, since both the welding rod and the base metal were of high tensile-strength steel. The operation required 915 pounds of steel rod, deposited in three layers to produce a total thickness of about 7/8 inch. The cylinder was stress-relieved after welding, and then machined to the original dimensions. This left a layer of weld metal 3/4 inch thick lining the cylinder.

Strain Gage Helps to Keep Cranes Upright

Cranes such as are used in railroad yards and on loading docks have been known to tip over when the long booms are in the extended position and heavily loaded. To warn the crane operator of such impending mishap, the Westinghouse Electric Corporation has devised a "policeman" in a little gray box. This box is mounted on the boom and is able to "sense" a combination of conditions that will cause trouble. It flashes a warning by light or bell to the operator's cab.

The principle employed is that of the magnetic strain gage. A bar a few inches long is attached to the boom and is caused to move when that member is compressed by the load. This movement is transmitted to the box, causing variation in two sensitive magnetized air gaps, the coils of which are connected electrically in a bridge circuit. This provides an electrical output proportional to the applied stress.

Tooling for Cold Roll-Forming



Roll-Forming Machines Can be Tooled to Emboss, Bevel, Coil, Curve, and to Produce Multiple Sections of Two or More Materials—Fourth in a Series of Articles on Cold Roll-Forming

By E. J. VANDERPLOEG
The Yoder Co., Cleveland, Ohio

As a strip passes through a roll-forming machine, each pair of rolls produces a partial change in the cross-section of the strip. The number of rolls required depends on the intricacy, thickness, and size of the section, and, to a smaller extent, on the kind of material to be formed. A simple angle or channel with straight web and flanges can usually be formed by three or four pairs of rolls, while the more complicated shapes generally require about twelve roll passes.

The tooling of a machine includes not only the main rolls, but the spacers, starting guides, and whatever shoes, idler rolls, straightening guides, and other accessories may be needed to produce a given shape continuously with the greatest accuracy and speed, yet with the lowest investment in tooling. It may also include provision for edge trimming, edge conditioning, leveling, straightening, seaming, fluting, embossing, curving, coiling, and beveling, as well as for the production of multiple sections.

Combining Different Materials into a Single Formed Section

Roll-forming equipment lends itself readily to supplementary operations such as mentioned because the machine, itself, aside from the one-piece base, consists of a series of standardized roll stands, any of which can be partially dismounted or completely removed to make room

and Auxiliary Operations

for attachments that serve special purposes. As a result, arrangements can be made for feeding two or more different materials into the machine at the same time. A strip of wood, fabric, cord, felt, metal rod, wire, or tube can be inserted into a roll-formed channel or box shape. Also, two pieces of metal can be formed into one piece, the edges of the lighter strip being folded in around the edges of the other to hold them together. The latter procedure permits the combination in one formed section of metals having two or more different properties, such as plain carbon steel with stainless steel or aluminum. Worthwhile savings can thus be effected, as compared with the making of a shape from a single strip of high-priced metal or of obtaining the equivalent through some slower step-by-step method of production.

For example, very thin strips (from 0.004 to 0.006 inch thick) of stainless steel or brass can be rolled face to face with a strip of heavier gage low-cost steel to form almost any shape. Fig. 1 shows a molding of this general type, in which thin stainless steel has been formed over a heavier cold-rolled strip, the edges of the former material being folded in over the latter to prevent separation by peeling from either side.

A variation of this procedure is the use of multiple rolls on one spindle to produce two or more sections of similar or different shapes from the same or different materials. An example of multiple roll-forming is shown in Fig. 2. The three channel shapes can be formed simultaneously from three narrow strips that are slit from a single triple-width strip at the entry end of the machine.

A more complex part consisting of both stainless steel and plain carbon steel is illustrated in Fig. 3. Three separate strips of material are fed simultaneously into the machine—one of heavy-gage carbon steel and two of light-gage stainless steel (shown in black). At the exit end of the machine is mounted a rotary cutter that splits the section into two identical strips which are used in making automobile radiator grills.

Provision for Continuous Feeding of Strip

For maximum production and economy, it is sometimes desirable to avoid stopping the roll-forming machine when one coil of strip has been used up and another coil has to be started. A simple looping mechanism and a butt-welder may be employed for this purpose, the latter for

Fig. 1. The Molding Illustrated was Produced by Forming Thin Stainless-steel Strip over a Heavier Cold-rolled Strip

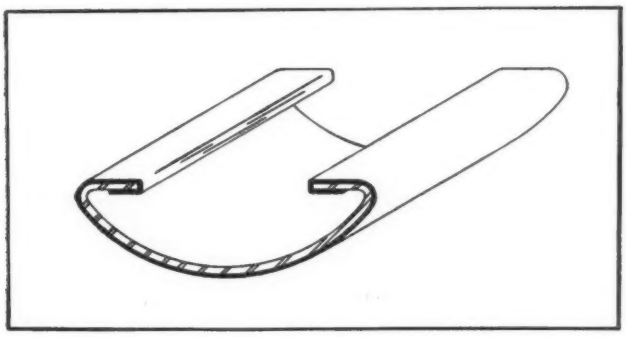


Fig. 2. Three Channel Shapes Can be Formed Simultaneously from One Strip that is Slit at the Entry End of the Forming Machine

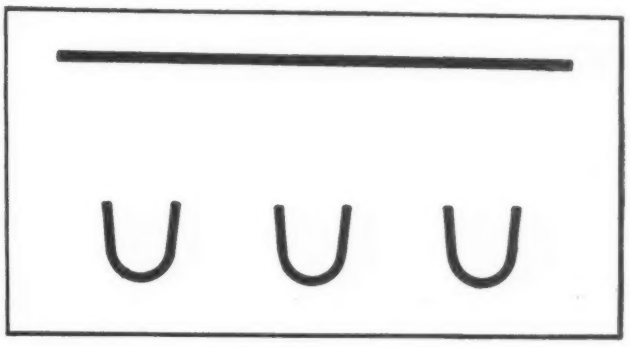
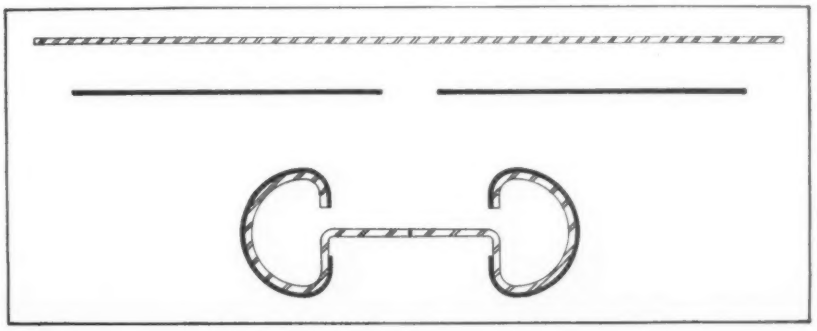


Fig. 3. (Right) This Section is Formed from Three Strips Fed Separately into a Roll-forming Machine. After Forming, the Stock is Slit to Make Two Sections for Automobile Radiator Grills



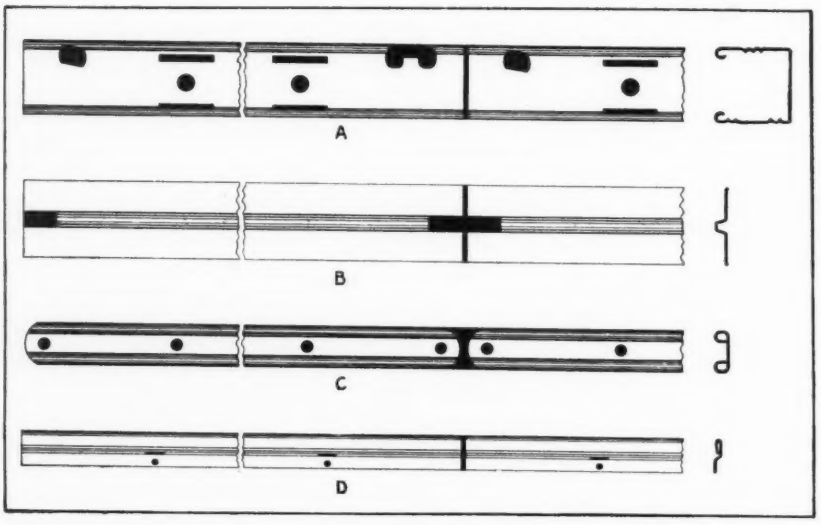


Fig. 4. Typical Examples of the End Shapes, Perforations, and Notchings that can be Produced by Different Tooling on the Cut-off Machine

welding the end of each coil to the end of the preceding coil. While the two ends are thus being joined, there is enough material in the loop to permit continued feeding, and by the time the weld is finished, the extra length of metal in the loop has been fed into the machine. The major application of this equipment is on complete tube mills.

Perforating and Making Ornamental Cuts

The flying cut-off machines can also be tooled for cutting the ends of cold-formed parts to various forms; they may be tapered, rounded, pointed, cut on a tangent, or provided with more or less complex ornamental or functional contours. Holes or slots can also be punched adjacent to the ends in the same operation. Fig. 4 shows four roll-formed shapes, each with different types of cut-offs, perforations, and notchings. At *A* are shown typical perforations required in Venetian blind headers; at *B*, the end notchings for joining the cut-off lengths of moldings after they are formed into rings for holding hot-air furnace jackets in place; at *C*, a section used in the manufacture of baby carriages; and

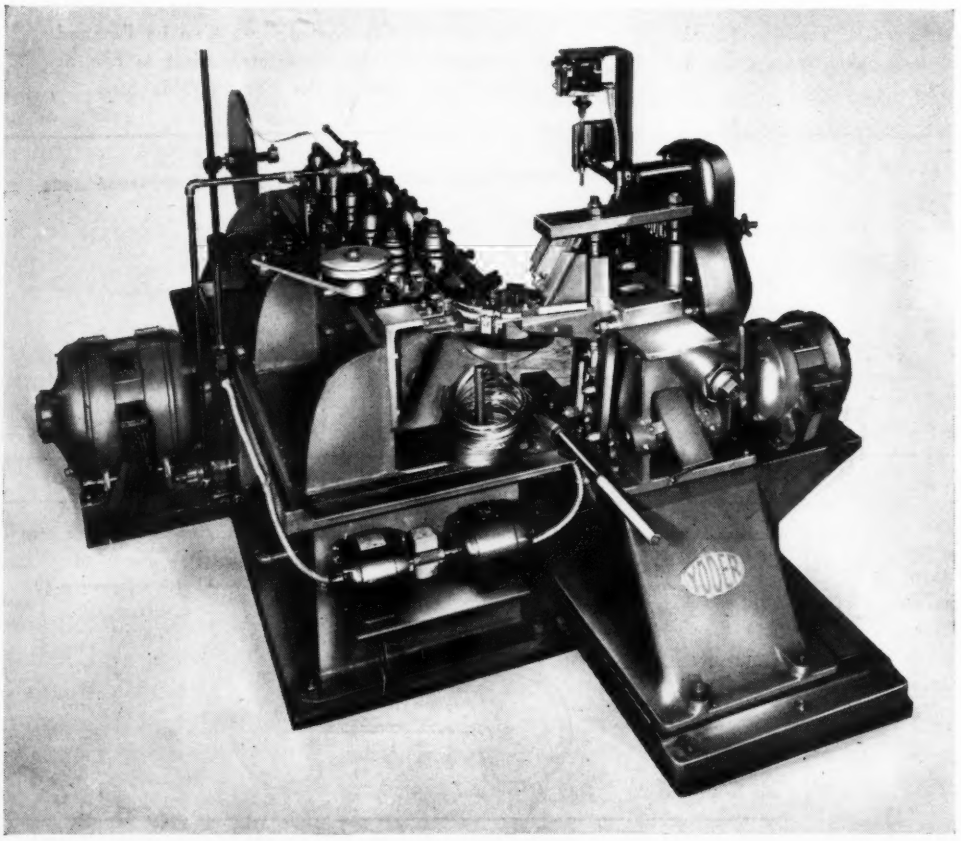


Fig. 5. A Curved Shoe Mechanism is Employed to Form a Ring on This Special Vertical-spindle Machine

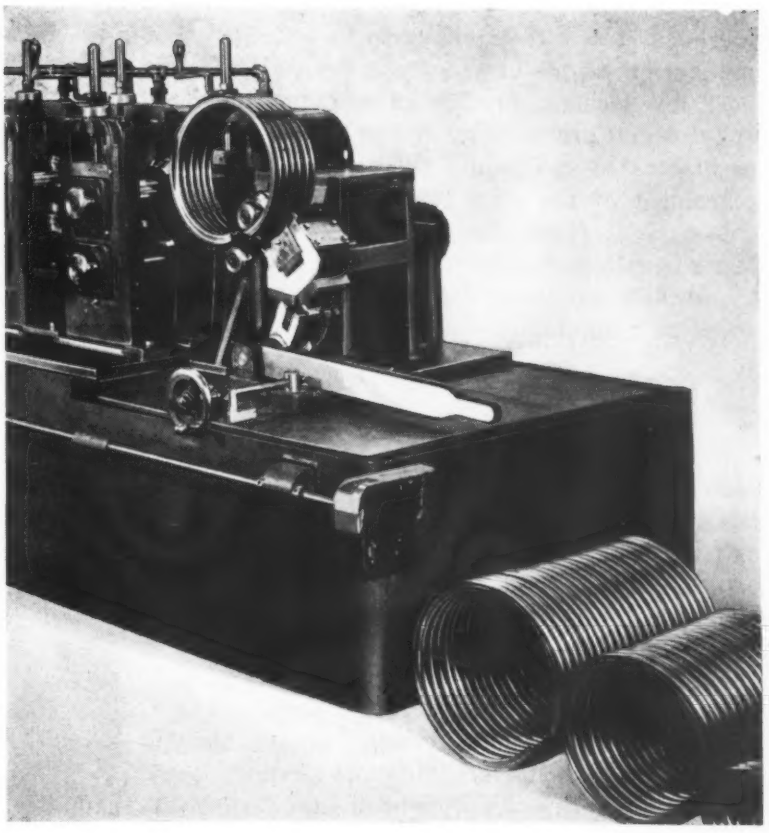


Fig. 6. Roller Type Coiling Attachments are Used when the Section is Too Heavy to be Coiled on a Shoe Type Mechanism

at *D*, the bottom reinforcing bar for a window screen.

In some cases, one cut-off machine may be sufficient for operations of the type illustrated, while in others, two machines may be necessary, one being placed at the entry end and the other at the exit end of the forming machine. Two machines are required when the finished shapes have deep legs or flanges, as in box or channel shapes, and slots or irregular cuts have to be made in the flanges. This can only be done on the flat metal, and must, therefore, be performed at the entry end of the roll-forming machine, while the final cut through the middle, completely severing the metal, is made as the finished strip comes out of the forming machine.

Metal strip can be embossed with decorative designs and functional markings at no increase in tooling cost except the additional expense of milling or engraving the pattern on one pair of forming rolls.

If the strip has to be embossed over its entire width, the embossing must be done on the flat strip, usually in the first pair of rolls; in cases where only part of the strip width has to be embossed over a relatively flat area, the operation may also be done in the first roll pass. But where a sharp pattern of considerable depth is required over a relatively flat area, the embossing rolls are placed next to the exit of the machine to avoid flattening of the design by subsequent forming pressure. Picture molding and automobile scuff plates are familiar examples of this type of embossing operations.

Strip may also be indented or marked at regular intervals for the positioning of tacks or nails or to facilitate installation.

Curving, Coiling, and Ring Forming

Many roll-formed shapes may be curved or formed into complete rings or spirals and cut off, in one continuous production line, without rehandling or added labor cost. The curving is usually done in a die, after which the section runs out on a curved table, as shown in the heading illustration, and is cut off by a standard machine.

For ring forming purposes, a number of arrangements, all very simple, have been designed and built. Some of them are of the curved-shoe type like that illustrated in Fig. 5. When the

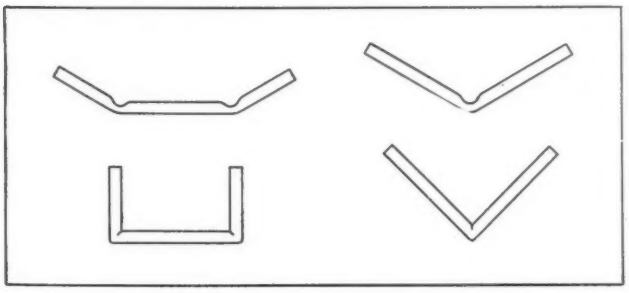


Fig. 7. One Method of Forming Sharp Corners Consists of First Rolling a Bead or Groove in the Stock, then Forcing the Strip into a Sharp Corner on a Roll

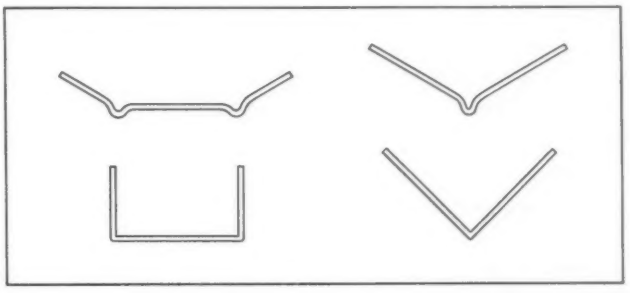


Fig. 8. If a Section is so Thin as to be Considerably Weakened by Grooving, it May be Formed to a Sharp Corner after an Initial Preforming Operation

section is too stiff or heavy to be coiled in this manner, the coils or rings are formed continuously by passing through an assembly of small rolls, which are suitably spaced and positioned, as illustrated in Fig. 6. The type, position, and placement of the ring forming equipment and cut-offs in the production line vary considerably, being usually best determined in individual cases by profiles to be produced, diameter of ring, speed of machine, and other factors.

Rounded or Beveled Edges and Sharp Corners

In some cases, it is necessary to round or bevel the edges of a section; in others, sharp corners are desirable. Rounding or beveling operations are normally performed with conventional rolls, but forming of sharp corners can only be done after a grooving or beading operation has been performed on the stock or after the section has been specially preformed for this purpose.

If grooving is necessary, the groove should penetrate the material from one-third to one-half of its depth. The strip can then be forced into a sharp corner of the roll and formed as shown in Fig. 7. Where strength is an important factor, this method has the disadvantage of weakening the section at the bend. Its use, therefore, is generally limited to stock thicknesses of more than 0.032 inch.

The preforming method, used for lighter gages, is illustrated in Fig. 8. The section is first formed with a sharp bend at the corner or corners, after which the bends are transformed to sharp corners in succeeding roll passes.

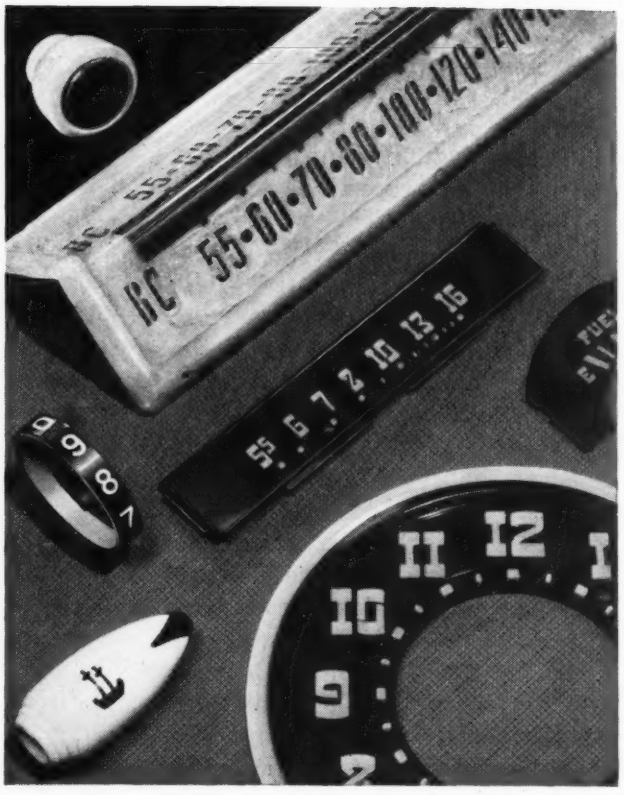
The products manufactured by cold roll-forming will be described in the next, and concluding, article of this series.

* * *

Bristol Co. Offers Instrument Courses

Bristol Co., Waterbury, Conn., manufacturer of automatic controlling, recording, and indicating instruments, is conducting a series of courses for plant instrument and operating men in the theory and application of industrial instruments. Each course consists of two weeks of lectures and laboratory work, with special emphasis on instrument maintenance and repair.

These courses are open to men interested in the application, servicing, and repair of instruments in all types of manufacturing plants. They are under the direction of F. A. Faust, education department, Bristol Co., Waterbury 91, Conn., from whom further information can be obtained.



Parts Made in Two Colors by Means of an Injection Molding Process that Utilizes Two Molds

Plastic Parts Made in Two Colors by Double Injection Molding

Plastic parts for such items as clock and radio dials, gages, and automobile parts can now be molded in two colors by means of a double injection molding process. This process, patented by the Gits Molding Corporation, Chicago, Ill., requires the use of two molds. Plastic of one color is injected into one mold for the insert or basic part of the object; this cools in a few seconds and is then removed from the mold, degated, and transferred to a second mold, where plastic of another color is injected. The plastic used for this process is Tenite, a cellulose acetate butyrate, manufactured by the Tennessee Eastman Corporation, Kingsport, Tenn. The molded parts are heat-resistant and non-fogging under glass—important considerations for the automotive and radio industries—and are said to be tough and chip-proof.

* * *

Engineers of the Chain Belt Co., Milwaukee, Wis., suggest that when chain sprockets are not too badly worn, they can be reversed on the shaft so as to use the opposite tooth surfaces. This results in a longer life for the drive.

Fundamentals of Cutting-Fluid Action

Abstract of a Paper Read before the Annual Meeting of the American Society of Lubrication Engineers

By M. EUGENE MERCHANT, Research Physicist
Cincinnati Milling Machine Co., Cincinnati, Ohio

ALTHOUGH a cutting fluid may be required to perform many different functions, depending upon the type of machining operation to which it is applied, it must perform the basic functions of removing the heat from the cutting tool and reducing the friction between the chip and the cutting tool, regardless of its application.

The heat removing ability of a cutting fluid directly affects the life of the cutting tool. This relationship between tool life and the temperature of the cutting tool has been found empirically by Schallbroch, Schaumann, and Wallichs, and is an exponential equation of the form

$$t^n \times T = \text{constant}$$

where

t = cutting temperature, in degrees C.;

T = tool life, in minutes; and

n = an exponent, the value of which depends mainly on the tool form and material. This exponent normally has a value of 20 in the case of high-speed steel tools.

Evidently, a small change in tool temperature will produce a large change in tool life. It is not unusual for a decrease of 25 degrees in tool temperature to raise the tool life from 1 hour to 2 1/2 hours—an increase of 150 per cent in tool life. Thus, it is essential that a cutting fluid have high cooling ability to be effective; high specific heat and high heat conductivity are the properties required. In general, these facts are well recognized.

The implications of the second basic function of a cutting fluid—its ability to reduce friction between the chip and the tool, and thus reduce the amount of heat generated—are not as generally understood. When a continuous chip is being produced, the metal is deformed by shear or plastic flow that takes place in a zone, known as the shear plane, which is essentially a plane extending from the cutting edge of the tool to the surface of the work.

A layer of metal having a thickness t_1 is deformed into a chip having a thickness t_2. This chip slides up the face of the tool, meeting with frictional resistance as it slides. An effective cutting fluid will decrease this frictional resistance, and thus will reduce the heat evolved. A lowering of the coefficient of friction also brings about a reduction in the deformation of the metal being removed. Therefore, when a cutting fluid performs its basic function of friction reduction, it reduces the heat generated by fric-

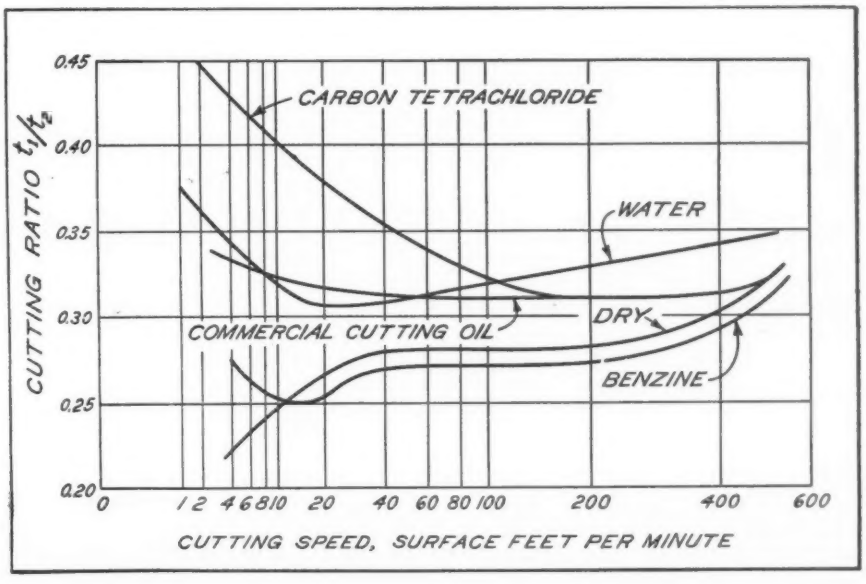


Diagram Showing how the Cutting Ratio t_1 to t_2 Varies for Different Types of Cutting Fluids and for Different Cutting Speeds

tion and also the heat generated in deforming the metal. The results are that tool life is prolonged; the reduced friction between the chip and the tool improves the surface finish; and the force on the tool, as well as the power consumption required to make the cut, is decreased.

Since the amount of deformation of the metal varies with the friction between the chip and the tool, the ratio of the thickness of the layer of metal to the thickness of the chip serves as a useful measure of the relative friction-reducing ability of a series of cutting fluids. This ratio t_1 to t_2 is known as the cutting ratio. If a series of different cutting fluids are applied to the machining set-up and the cutting ratio determined, the fluid giving the highest ratio can, in general, be rated as having the best friction-reducing properties.

The cutting ratio is determined by collecting the chips obtained and measuring them. The cutting ratio can then be calculated from the equation

$$r_c = \frac{16.4A_o s}{M}$$

where

r_c = cutting ratio;

A_o = cross-sectional area of layer of metal from which chip was produced, in thousandths of a square inch;

s = specific gravity of work material; and

M = weight of chip per unit of mean length, in milligrams per inch. The effect of some typical cutting fluids on the cutting ratio is shown in the accompanying illustration.

Cutting fluids are able to reduce friction between the chip and the tool by hydrodynamic and chemical action. If the products of the chemical reaction are of the right type, they account for a considerable reduction in friction. It is necessary that the reaction products be solid materials having low resistance to shear. When such films are present, the chip and tool are separated by a microscopic layer of weak non-fluid material that will prevent metal-to-metal contact and reduce resistance to sliding.

As an example, when carbon tetrachloride is applied to the machining of aluminum, one of the principal products formed under the severe conditions existing at the chip-tool interface is aluminum chloride. This film of aluminum chloride, which coats the surface of the chip and tool, has a shear strength much lower than that of the base metal and so allows free sliding of one surface past the other.

It is the function of chemical additives in cutting fluids to form such films. The oil or water that carries these additives (such as sulphurized and chlorinated materials or free fatty acids) plays little if any part in reducing the amount of friction; it is merely a carrier for the chemically active materials. Control of these chemical reactions at the chip-tool interface is the key to major advances in cutting-fluid performance.

* * *

Chromated Protein Coatings Inhibit Corrosion

Chromated protein coatings offering a convenient, inexpensive means of protecting metals —especially zinc, iron, steel, brass, and aluminum—during outdoor storage in mildly corrosive atmospheres have been developed by the National Bureau of Standards. The protective value of such films is somewhat better than that afforded by chemical surface treatments, and is much superior to that of corrosion-inhibited oils and waxes. The metallic surface to be coated is first dipped in casein, albumin, or gelatin; the resultant film is then impregnated with chromate, which hardens the film and inhibits corrosion.

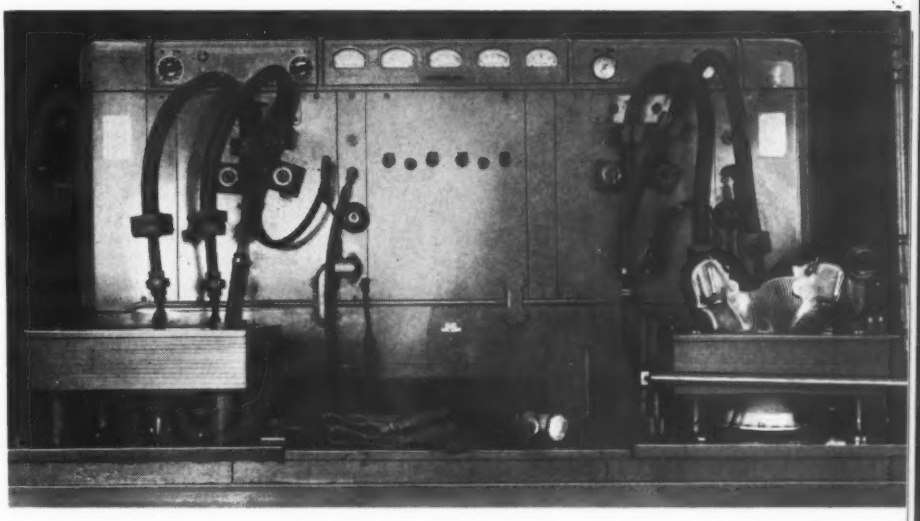
The chromated protein films are yellow, and unless opaque pigments have been added, are transparent. Their flexibility and adhesion are sufficient to prevent cracking or separation when the metal is bent. They are not injured by heating to 150 degrees C., whereas most chromate films produced chemically on zinc lose much of their protective value at 100 degrees C. The thickness of the film depends principally on the concentration and viscosity of the protein solutions, varying with the type of protein up to about 0.0002 inch.

When freshly prepared and hardened, the films are almost insoluble in water and are so hard that they cannot be scratched with the fingernail. Exposure to light further hardens some films and renders them still less soluble. However, the films can be quickly removed from metal parts by application of an alkaline solution, such as 5 per cent sodium hydroxide.

The protein solutions, unlike the baths used for direct phosphate or chromate treatments, do not become exhausted and require replenishment, but are fairly stable for long periods. While chromated protein films are superior to direct phosphate or chromate coatings or to oil films for corrosion prevention, their life is less than that of suitable paint coatings. They are more effective on large, regular surfaces than on the sharp edges and corners of small objects, such as nuts and bolts, where the film tends to pull away.

Unique Applications of Induction Heating

PRODUCTION engineers of the Pratt & Whitney Aircraft Division of the United Aircraft Corporation, East Hartford, Conn., have adopted induction heating in numerous processes. A few unique applications in operations other than hardening are described in the following.



During the war, it became necessary to develop a quick method for separating the aluminum cylinder heads of aircraft engines from the steel barrels to which they are screwed and shrunk when the barrels became worn. When separated, new assemblies were made by replacing the worn barrel.

Previously, employing gas flames from a hand torch for this purpose, not more than eighty cylinders could be disassembled per day per man. By the use of an induction heating set-up, approximately forty cylinder heads of the smaller type can be removed from the barrels in an hour. Also, with a gas flame, heating was non-uniform and often resulted in uneven expansion and cracking of the head. With the induction heating method, a predetermined fin temperature can be accurately maintained, and expansion of the head is thus kept uniform.

A Tocco induction heating unit consisting of a 50-K.W., 9600-cycle generator, a 90-H.P. motor, and four water-cooled, high-frequency condensers is used. Two stations, each holding a cylinder assembly, were mounted on the front of this heating unit, as shown in Fig. 1. The coils in which the cylinder assemblies are inserted were made from copper tubing, 5/8 inch outside diameter, with a wall thickness of 0.049 inch, covered with a single layer of varnish-impregnated asbestos tape. These coils are located at the correct height to surround the "shrink band" that holds the head and barrel together.

With a cylinder assembly in place, power is applied to heat the head and barrel inductively to approximately 575 degrees F. To determine the most effective power setting and heating cycle, a direct-reading thermo-couple is used. In order to maintain the hardness of the head, it is necessary to keep the temperature at any point on the cylinder below 600 degrees F. It has been determined that 30 K.W. power is best

Fig. 1. (Above Right) Induction Heating Unit Equipped with Two Stations for Separating Aluminum Cylinder Heads from Steel Barrels

Fig. 2. (Right) After Heating the Head and Quenching the Barrel, the Head can be Unscrewed. A Disassembled Head and Barrel are Seen at the Left

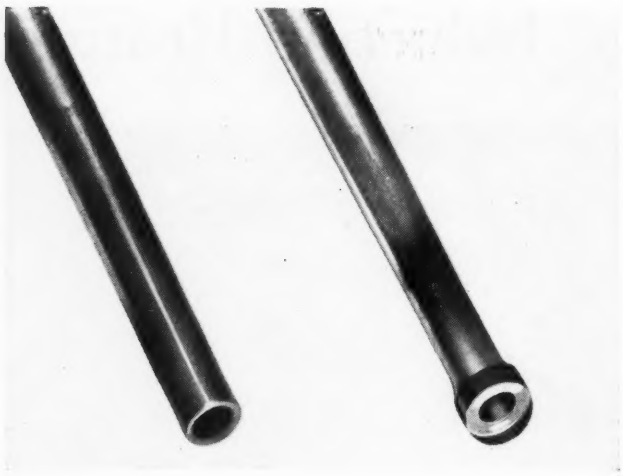


Fig. 3. Tubing Shown at the Left is Rapidly Heated and Upset to the Form Seen at the Right by the Use of the Fixture Illustrated in Fig. 4

for small work, and 15 K.W. for large parts. As the heat is transferred more slowly through the longer fins of the larger sized parts, too rapid a heat application would cause the outer edges of the fins to melt.

A time-clock automatically shuts off the power after a few minutes, and allows water to flow to an internal quenching fountain. The fountain directs an "umbrella" of water onto the bore of the steel barrel, shrinking it away from the hot expanded aluminum cylinder head. The coil is then lowered manually, and the head is unscrewed from the barrel by an operator, who wears asbestos gloves, as seen in Fig. 2. A disassembled head and barrel are shown at the left.

Production of push-rods for Pratt & Whitney aircraft engines has been increased by means of an induction heating fixture. With this double-end fixture, high-frequency current is employed to heat the end of the rods, after which the rod rolls into an end-forming die.

Seamless steel tubing, 5/8 inch in diameter, with walls 1/16 inch thick, is used for the push-rods. After facing, centerless-grinding, burring, cleaning, swaging to form a taper, and straddle-milling to length, the tube appears as shown at the left in Fig. 3. It is then placed in the fixture seen in Fig. 4, with its ends between the flaps of the two partially folded "pancake" coils.

The "pancake" coils consist of four turns of 3/16-inch diameter, extra heavy copper tubing, and carry 10 K.W. of 200,000-cycle power from a Lepel spark-gap oscillator. Heat is thus localized in both ends of the rod simultaneously, heating them to 2200 degrees F. in nine seconds. The heating fixture is made of insulating Micarta, assembled with brass screws. The copper coils are encased in Transite sheeting.

At the completion of the heating cycle, a solenoid-actuated pin releases the rod, allowing it to roll on to the double-end upsetting die shown in the background. The upper half of the die is lowered on the rod, and cam-actuated plungers at both ends of the die enter the bore of the tube. Shoulders on these plungers force the hot ends of the tube into impressions in the die, producing a part of the shape shown at the right in Fig. 3.

By depressing the small handle shown just in front of the heating fixture in Fig. 4, the formed part is lifted from the die. The operator then uses the hooked screwdriver, shown in his right hand, to remove the push-rod from the die. Since the heat is localized, the operator can safely handle the central portion of the rod. The flash is then ground from the formed ends, and the parts are hardened.

For speed, simplicity of maintenance, low cost, deeper penetration, and fewer induced stresses, 60-cycle electrical current is preferred to high-frequency current for heating, where it is applicable. A heater using this type of current was developed for installing shrink-fitted bronze

Fig. 4. Both Ends of Push-rods are Placed between the Formed Coils of an Induction Heating Fixture, where They are Heated to 2200 Degrees F. in Nine Seconds

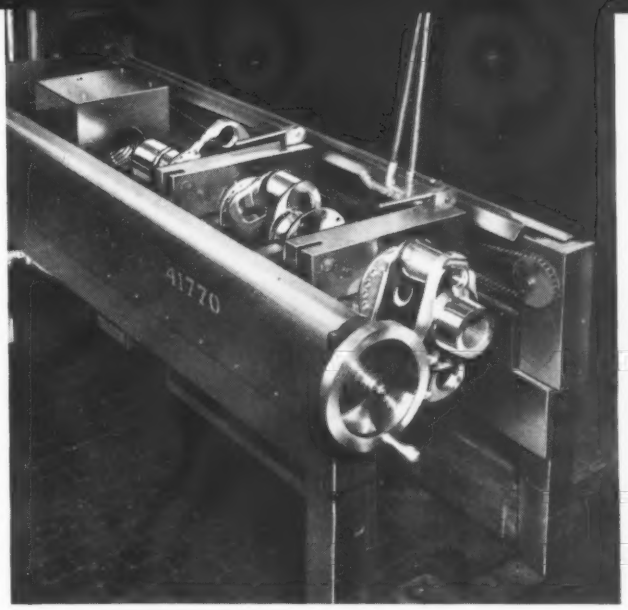


Fig. 5. The Front End of Aircraft-engine Crankshafts is Heated in this 60-cycle Induction Unit to Permit Installation of Internal Shrink-fitted Bearings

bearings in the front end of airplane-engine crankshafts. This resulted in an increase in production of 900 per cent.

Formerly, the crankshaft was soaked in an oil bath maintained at 425 degrees F. to expand it sufficiently to enable the bearing to be installed. This method had several disadvantages, among which were that the oil became trapped between the bearings and the wall of the crankshaft; the oil fumes were objectionable to the workers; hot oil frequently splashed on the operator; and production was slow. With the improved method of heating, all these objectionable features have been eliminated, and about fourteen crankshafts are completed an hour by one operator.

The equipment, as shown in Figs. 5 and 6, consists of a panel board on which are mounted a time-clock, relays, and switches; a heating fixture; and a 20-KVA transformer, the primary operating on 220-volt, 60-cycle, single-phase alternating current, and the secondary delivering 2000 amperes at 9 volts.

The heating fixture is made of a cam-guided, tilting and sliding metal carriage for holding the crankshaft; an enclosed water-cooled inductor coil; and two micro-switches for controlling the heating and demagnetizing cycles. The inductor coil contains six turns of 5/8-inch diameter, extra heavy copper tubing, close-wound to a 4 7/8-inch diameter. The coil is insulated with two layers of asbestos tape, properly impregnated and baked. Cooling water containing soda to prevent bacterial growth is circulated through the tubular leads and coils.

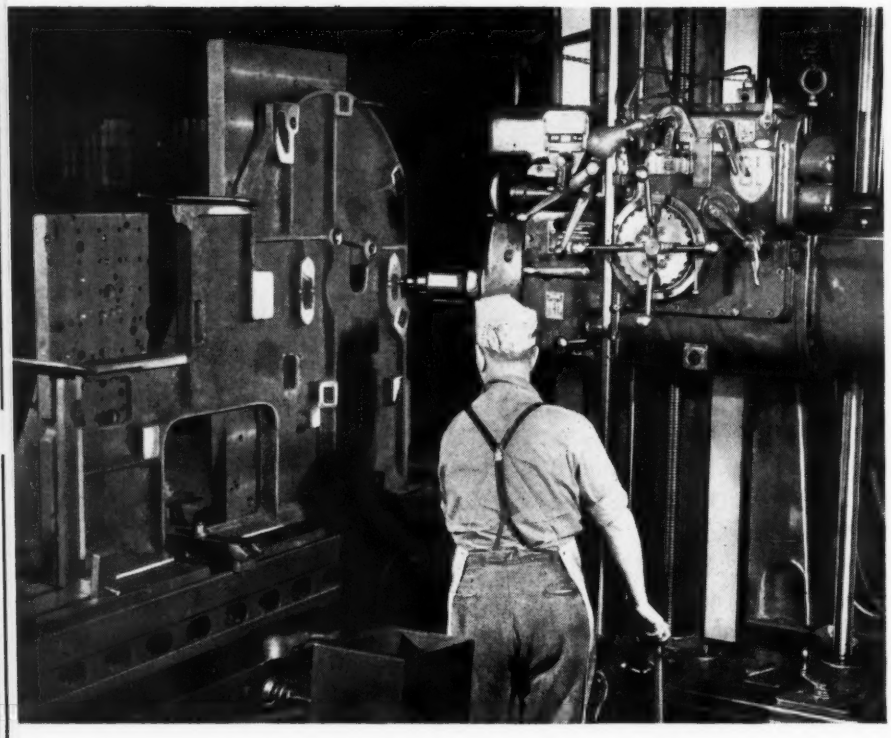
When the handwheel shown at the front of the fixture is turned clockwise, the carriage holding the crankshaft moves toward the enclosed inductor coil at the rear. Simultaneously, the crankshaft (shown in a vertical position in Fig. 6) is moved into a horizontal position, as seen in Fig. 5, by cam tracks built into the vertical sides of the fixture frame. The two upper carriage bearings are always in the horizontal portion of this track, while the two lower ones move from the vertical to the horizontal portion.

Continued turning of the handwheel in a clockwise direction moves the carriage horizontally and causes the crankshaft end to enter the inductor coil. At this point, a cam on the carriage actuates one of the micro-switches on the fixture frame, thus closing the circuit and permitting the operator to start the heating cycle by depressing a push-button.

The crankshaft end is heated to 400 degrees F. in a 2 3/4-minute cycle. By turning the handwheel counter-clockwise, the carriage and crankshaft are withdrawn from the coil and tilted to the vertical position. During this movement, the amount of current flowing through the coil is automatically reduced to demagnetize the crankshaft. At this point, a second cam on the carriage actuates another micro-switch and breaks the circuit. The bronze bearing, which has been cooled to minus 20 degrees F., can then be pressed into the bore of the crankshaft.

Fig. 6. View of Induction Heating Fixture Illustrated in Fig. 5, with Crankshaft Raised to a Vertical Position and a Bearing being Pressed into Heated End

Producing Intricate Parts on a



Intricate Castings for Package-Making Machines are Quickly and Accurately Produced on a Single Horizontal Boring, Drilling, and Milling Machine. Often the Work Set-Up Need Not be Changed; thus Production is Increased and Cumulative Errors Resulting from Separate Set-Ups are Eliminated

By
IRA P. MABIE
Giddings & Lewis Machine Tool Co.
Fond du Lac, Wis.

MACHINES for making paper bottles, bags, cartons, and other containers perform a continuous series of cutting, folding, gluing, sealing, and stitching operations at a production rate commonly exceeding a hundred containers per minute. Many of the parts of these machines must be accurately produced to ten-thousandths of an inch, in order to maintain the quality and uniformity of the product.

The largest parts of a package-making machine are its frame and base members. Since practically all of the rolls, knives, gearing, drives, and brakes are mounted directly or indirectly on these intricate castings, they require a major portion of the accurate machining necessary. Ordinarily, such parts must be milled, drilled, bored, reamed, faced, counterbored, back-bored, and back-faced. Also, numerous bosses and pads must be machined, slots cut, and various sized holes drilled and tapped.

Frames for package-making machines differ from most castings and weldments in that, while relatively large in size, they are quite shallow.

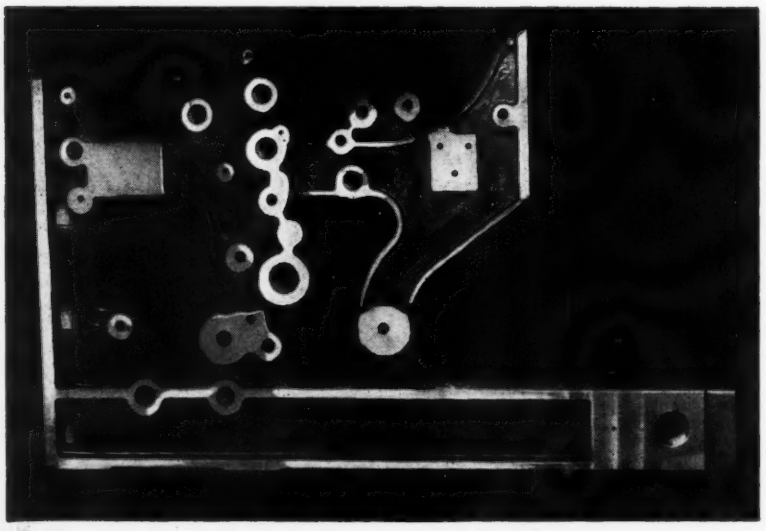


Fig. 1. Intricate Frame Casting for a Package-making Machine. All the Holes are Bored or Drilled and the Surfaces Milled on One Multiple-purpose Machine Tool

Multiple-Purpose Machine Tool

Typical side frames of machines made by H. G. Weber & Co., Inc., Kiel, Wis., are shown in the heading illustration and in Fig. 1. Extreme care must be taken in machining such thin, intricate-shaped castings to prevent generating sufficient heat to distort the frames. Misalignment of bores and mating surfaces, leading to difficulties at assembly or inefficient operation, results from too high feeds or cutting speeds. By planning the sequence of operations carefully, the generation of heat can be kept to a minimum.

Several manufacturers of package-making machines are now employing horizontal boring, drilling, and milling machines for this work. By merely changing the cutting tools, and thus avoiding the need for setting the work up again or moving it to different machine tools, frame production has been increased and machining inaccuracies reduced.

Right- and left-hand frames of a large paper bag machine are shown being drilled in Fig. 2, employing the high-speed auxiliary spindle of a Giddings & Lewis machine. The two frames are rigidly clamped together to insure alignment of all the bores and slots. This method of mounting on the table of the multiple-purpose machine also helps to prevent distortion, since the thickness of the work is doubled. The set-ups and operations performed in completing a pair of frames on this machine are as follows:

1. With the frames lying flat on the table of the machine, the bases are milled and holes in the bases are drilled, spot-faced, and tapped.
2. Still lying flat, the frames are rotated through an angle of 90 degrees, and two support boss faces are milled.
3. After rotating through an additional 50 degrees, a bearing box is milled and four holes for a bearing cap are drilled and tapped.
4. The frames are then indexed 40 degrees more and their top flat surfaces are milled.
5. A final indexing of 90 degrees places the frames in position for milling the top and middle bearing boxes and a pad, and drilling and tapping the bearing-cap holes.
6. The frames are then set upright, using an angle-plate support as shown in the illustration, and the various pin, cam-button, and gear holes are drilled and bored.

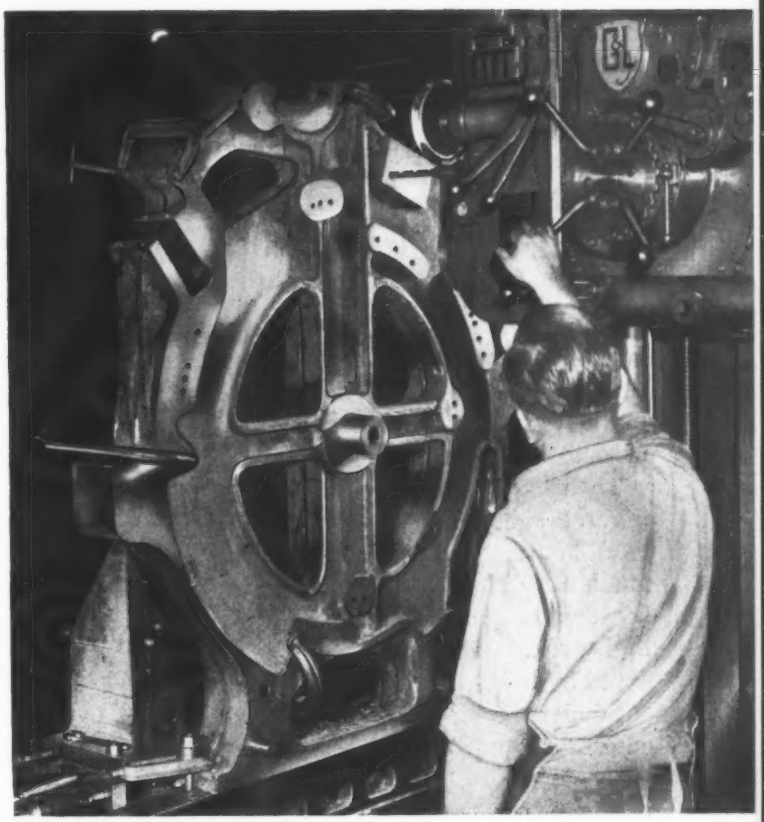
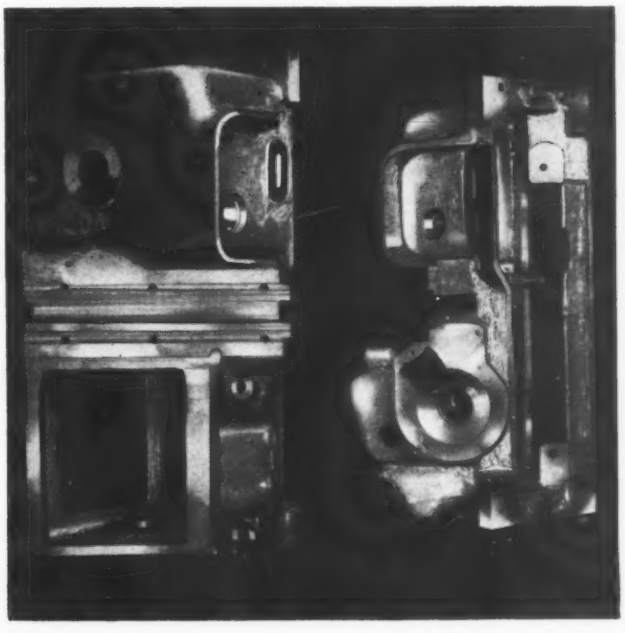


Fig. 2. Accurate Alignment between Right- and Left-hand Frames is Obtained by Boring, Drilling, and Milling with the Frames Clamped Together

Fig. 3. Complex Bridge-feeder Casting which is Accurately Machined at Various Angles by Means of the Set-up Shown in Fig. 4



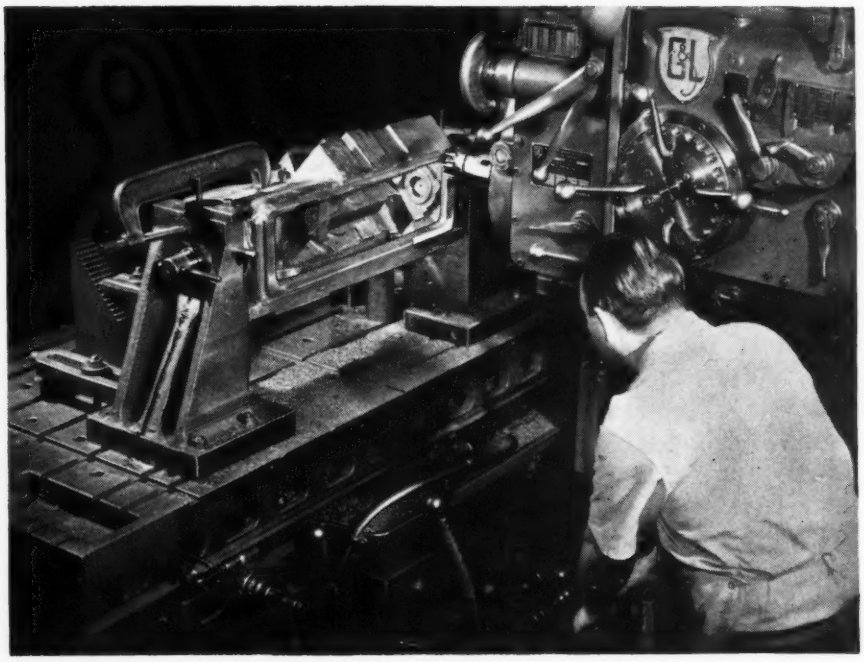


Fig. 4. A Trunnion Type Fixture is Employed to Position the Part for Performing Various Operations

The centrally located main bore of these frames is 3.2500 inches in diameter, and is machined to a total tolerance of 0.0005 inch. The location of four gear centers in the lower faces of the frames relative to each other and to the center of the main bore is maintained within 0.0005 inch. Scales and verniers on the horizontal boring, drilling, and milling machine are used to locate these holes.

The time required for making the six set-ups is about two hours, and the total machining time is thirteen hours. Both high-speed steel and carbide tools are employed. For high-production work, further time could be saved by using a rotary table to index the frames.

Small complex parts can be handled with equal efficiency on the same machine. For example, the intricate-shaped casting shown in Fig. 3, which is a bridge feeder for a package-making machine, is milled, drilled, tapped, bored, and slotted at various angles.

A trunnion type holding fixture, Fig. 4, is employed to position the part for the various operations. The cover-plate surface of the casting is shown being contour-milled. A combination of headstock and table feeds is used to perform this continuous milling operation.

This relatively small casting must be repositioned nine times, and seventy-five machining cuts are required to finish it. The total machining time is thirty-three hours. Bearing housing diameters are bored to size within 0.0005 inch, total indicator reading.

Since there are no machine members to obstruct or limit the size work that can be handled on horizontal boring machines, large castings can be accommodated on relatively small machines, as shown in Fig. 5. Such set-ups are, however, the exception, their use depending on the cost and time required for the set-up and the range of feeds available on the machine.

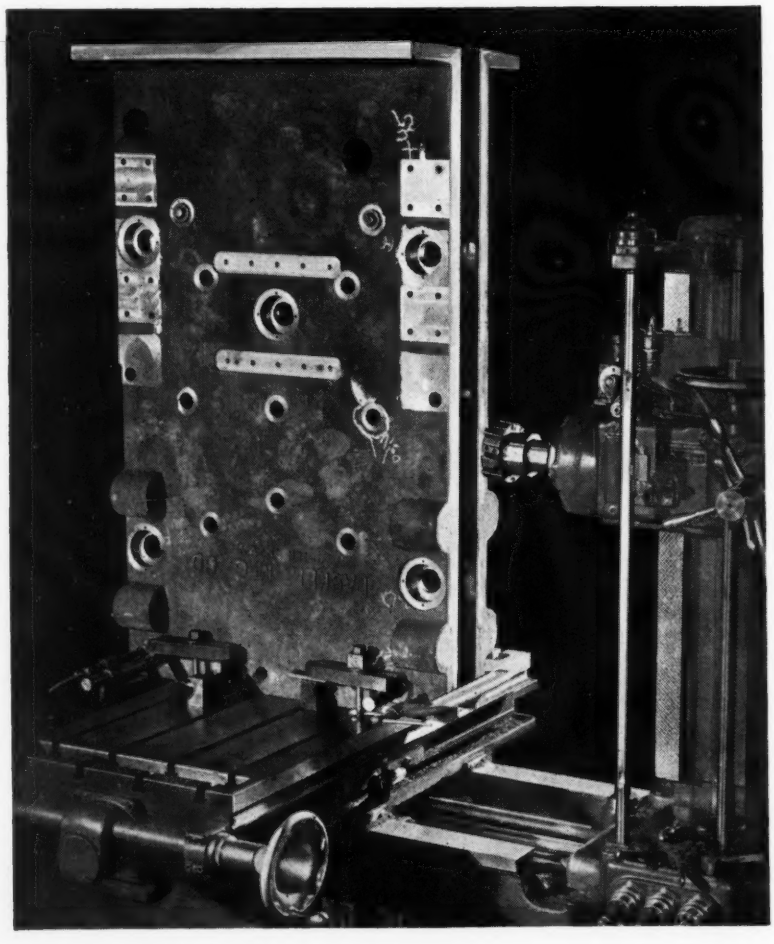


Fig. 5. Large Parts Can Often be Handled on Small Horizontal Boring Machines, as There are No Columns, Rails, or Cross-members to Interfere with the Work

Metal-Working Industry Plans National Apprenticeship Program

A NATIONAL apprenticeship program covering the entire metal-working industry is now being developed as an aid in building up the skilled working force in the various trades throughout the industry. To carry out this undertaking, an apprenticeship committee composed of representatives of national management, labor, and professional organizations has been established at the request of the Bureau of Apprenticeship, U. S. Department of Labor. Assisting the committee are representatives of the Bureau of Apprenticeship.

The getting together in a joint committee of these various groups to organize an industry-wide apprenticeship program marks an important step toward the development of an adequate supply of skilled workers. The industry is keenly aware of the struggle it had during the war years to obtain the skilled workers needed for quantity production and of the vital necessity for action to avoid a repetition of that experience in the future.

The immediate objective of the committee, to be known as the National Joint Apprenticeship Committee for the Metal-Working Industries, will be to set up standards of training for machinists and tool- and die-makers in the metal-working industries. The results of acceptance of such standards by both labor and management are obvious. The caliber of journeymen machinists and tool- and die-makers will be raised; any graduate apprentice can be hired with assurance on the part of management that he is qualified; and equally important, an apprentice will be assured that, regardless of the area or plant in which he served his apprenticeship, he will be a capable journeyman machinist at the conclusion of his training. An indirect, but probably the most important benefit, may be a gradual improvement in both the quality and quantity of goods produced in industrial plants because of better qualified employes.

The committee held its initial meeting in the Engineering Building, New York City, on April 20 and 21. Much progress was made toward the establishment of a skeleton standard for machinist apprentice. The plan provides for training apprentices both in the shop and in the classroom for all-around skilled craftsmen.

The chairman and vice-chairman of the committee are, respectively, J. E. Goss, chairman of the Educational Committee, National Machine Tool Builders' Association; and Joseph H. Piconke, international representative, United Automobile and Agricultural Implement Workers, C.I.O. The committee secretary is Professor Alexander Luce, Pratt Institute, Brooklyn, N. Y., and representative of the American Society of Mechanical Engineers. The other members of the committee are George Eaton, executive secretary, National Tool and Die Manufacturers Association; Joseph M. Schappert, director of industrial education, National Metal Trades Association; Charles C. Gorham, chairman, Apprenticeship Committee, American Society of Tool Engineers; James B. Gent, international representative, United Steelworkers of America; E. E. Walker, general vice-president, International Association of Machinists; A. J. Hayes, general vice-president, International Association of Machinists; and J. Dermody, United Electrical, Radio, and Machine Workers of America.

Assisting in this undertaking and functioning as consultants to the committee are E. K. Jenkins, assistant director, Bureau of Apprenticeship, U. S. Department of Labor, and national consultant on apprenticeship for the Machine Tool Industry; and Chester T. Morey, machine tool specialist, both of whom are connected with this agency's Boston office.

* * *

New Officers of the Pressed Metal Institute

At the annual meeting of the trustees of the Pressed Metal Institute, held in Cleveland, Ohio, on April 21, the following officers were elected for the ensuing year: President, Tom J. Smith, Jr.; executive vice-president, Walter A. Gorrell, E. J. McAleer & Co., Philadelphia; secretary-treasurer, J. J. Boehm, Boehm Pressed Steel Co., Cleveland, Ohio.

* * *

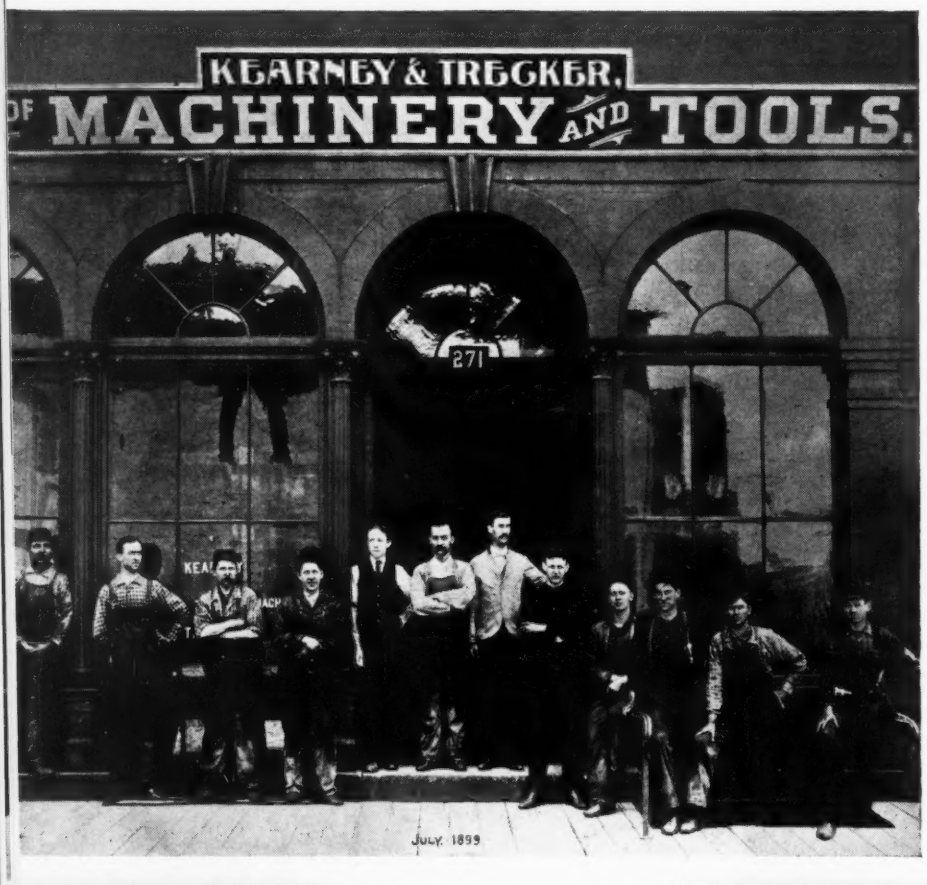
The number of aircraft in service on regularly scheduled airlines reached a total of 961 in December, 1947, of which 793 were operated domestically and 168 to points outside the United States. Sixty all-cargo planes were in operation.

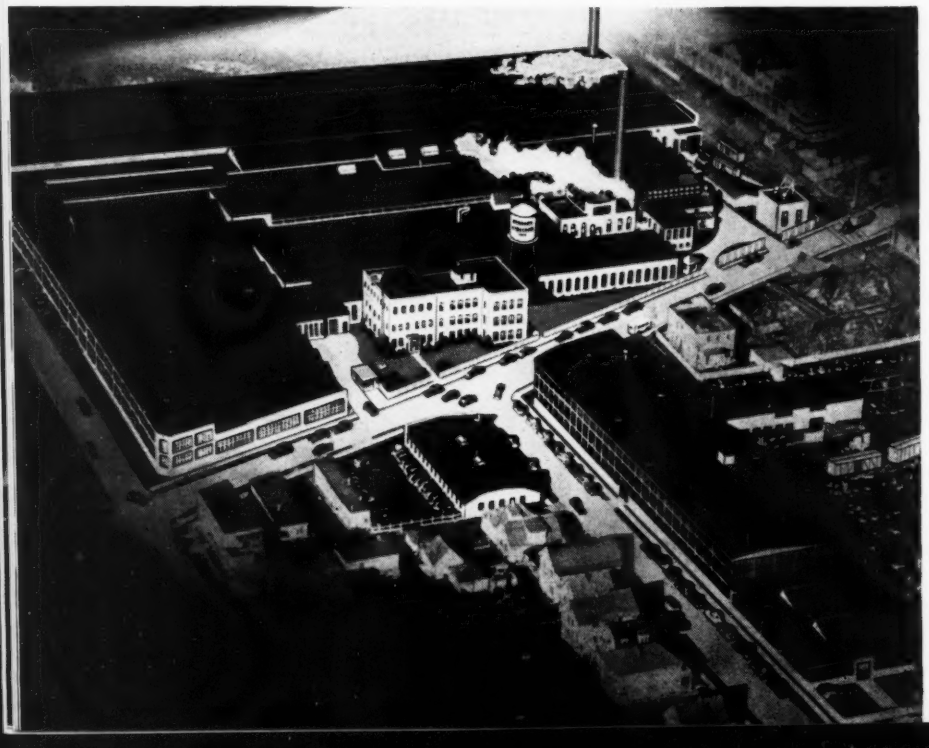
Kearney & Trecker Celebrates Golden Anniversary

THE Kearney & Trecker Corporation, Milwaukee, Wis., builder of precision and production machine tools for milling and boring, celebrated its Golden Anniversary May 17, 1948. An open house for employes and their families, commemorating the occasion, was held at the plant on May 16.

Organized as a partnership by Edward J. Kearney and Theodore Trecker fifty years ago, the company specialized for many years in the manufacture of standard milling machines, gradually expanding its line as the market grew. A line of precision boring machines was introduced in 1942.

The decision of Messrs. Kearney and Trecker to enter business hinged on a bit of history—the outcome of Admiral Dewey's encounter with the Spanish fleet at Manila in April, 1898. It had been determined in advance that should the Americans win the engagement, the prospect of early peace and a period of great business opportunity would almost certainly be realized. The die was cast with an American victory, and the men teamed up.





The company's original quarters (Fig. 1) comprised a small shop of some 1200 square feet in Milwaukee. Through the years, other buildings and property were acquired until today the plant facilities (Fig. 2) cover more than fourteen acres and 1800 persons are employed.

From the beginning, the growth of the concern has been stimulated by product development and research. The 1947 Machine Tool Show represented a high point for new Kearney & Trecker developments. Introduced at that Show were completely new lines of bed type milling machines and precision boring machines; a simplified No. 2 size knee type milling machine; a line of knee type milling machines with automatic cycle table control; another line of milling machines featuring built-in chucking type tables; and a face-mill cutter grinder.

Fig. 1. (Left Above) First Kearney & Trecker Shop Occupied a Floor Space of Only 1200 Square Feet

Fig. 2. (Left Below) Present Offices and Factory of the Kearney & Trecker Corporation Cover Fourteen Acres

The company was a pioneer in the application of tungsten- and tantalum-carbide milling cutters, first using these cutters on cast iron in 1929, and later—in 1943—on steel. In 1939, the principle of rotary-head milling was perfected in a machine capable of transmitting any geometric shape from a blueprint directly to metal—a method that materially simplified the making of tools, dies, molds, hobs, and production parts having multiple radii and intricate shapes.

In 1940, Kearney & Trecker became one of the first to establish an assembly-line technique in the manufacture of machine tools. The system worked so well that it has been permanently adopted, with some modifications, for peacetime production. In 1943, the company put into effect a retirement income plan for all employes. Length and loyalty of employe service is attested to by an Old Timers' organization, whose accumulative service is 5833 years for 224 members.

Edward J. Kearney, co-founder, died in 1934, at which time he was secretary-treasurer of the firm. Theodore Trecker, now eighty years of age, retired from the presidency in July, 1947, and was succeeded by his son, Joseph L. Trecker, who died suddenly in October, 1947. Francis J. Trecker was elected president in November, 1947. Other officers of the company are R. L. Bischoff, secretary-treasurer; J. B. Armitage, vice-president in charge of engineering; and R. W. Burk, vice-president in charge of sales.

* * *

Engineering Scholarships Established by Monarch Machine Tool Co.

Directors of the Monarch Machine Tool Co., Sidney, Ohio, have unanimously approved the establishment of a fund of $30,000 from which, over the next five years, fifteen scholarships of $2000 each will be awarded, three each year. These scholarships will be available to boys graduating from Shelby County (Ohio) schools with high scholastic records, who wish to pursue the study of mechanical or electrical engineering at a leading college or university anywhere in the country. Each of the $2000 scholarships will be dispersed in amounts of $500 annually.

* * *

Last year, one automotive firm delivered 13,400 cars to disabled veterans of World War II. These cars were equipped with special devices, including hand-operated throttle and brakes, provision for left-hand or right-hand operation, and other special features.

Machine Tool Sales Engineering Course at Cornell University

Machine tool selling will be examined from both close and long range at a special summer short refresher course in sales engineering to be held at Cornell University, Ithaca, N. Y., July 12 to 23, inclusive. This course, which will be conducted by the Sibley School of Mechanical Engineering in cooperation with the National Machine Tool Builders' Association and the American Machine Tool Distributors' Association, is the first course offered by a college to emphasize the sale of capital equipment in American industry. The course is a part of the vigorous promotion program for the industry that has been planned for 1948 by the National Machine Tool Builders' Association under its new president, A. G. Bryant, vice-president of Cleereman Machine Tool Co. Daniel R. Weedon is chairman of the Association's committee for the course.

Leaders from industry and educators will discuss forty-seven different sales engineering topics during the two-week course. Subjects scheduled for discussion will include detailed topics, as, for example, man-machine charts, shop lay-out, and the interview, as well as such broader aspects of the machine tool industry as foreign sales and the role of the sales engineer in industry. Other parts of the program will deal with the psychology of selling, case studies, specific sales procedures, and the use of advertising in selling. Informal discussions will follow most of the sessions.

The faculty for the course will be made up of forty-three persons, including Cornell faculty members, sales executives from the machine tool industry, and customers experienced in the purchase and application of machine tools. The fifty-three students already selected represent sales and district managers and sales engineers in the machine tool building and distribution fields.

* * *

The only way any of us can earn more is to produce more. Increased production is the answer to the big majority of our individual troubles, and certainly it is the only sure way to reduce the high cost of living. Planned economy will not work. We have witnessed many such attempts that have failed dismally. It is human relationships that make the wheels of production turn, and both management and labor must recognize each other's interest on a mutual basis.—*Clayton R. Burt, President, Potter & Johnston Co.*

Manually Operated Hidden-Arc Welding Equipment Applied in Fabricating Machine Tool Members

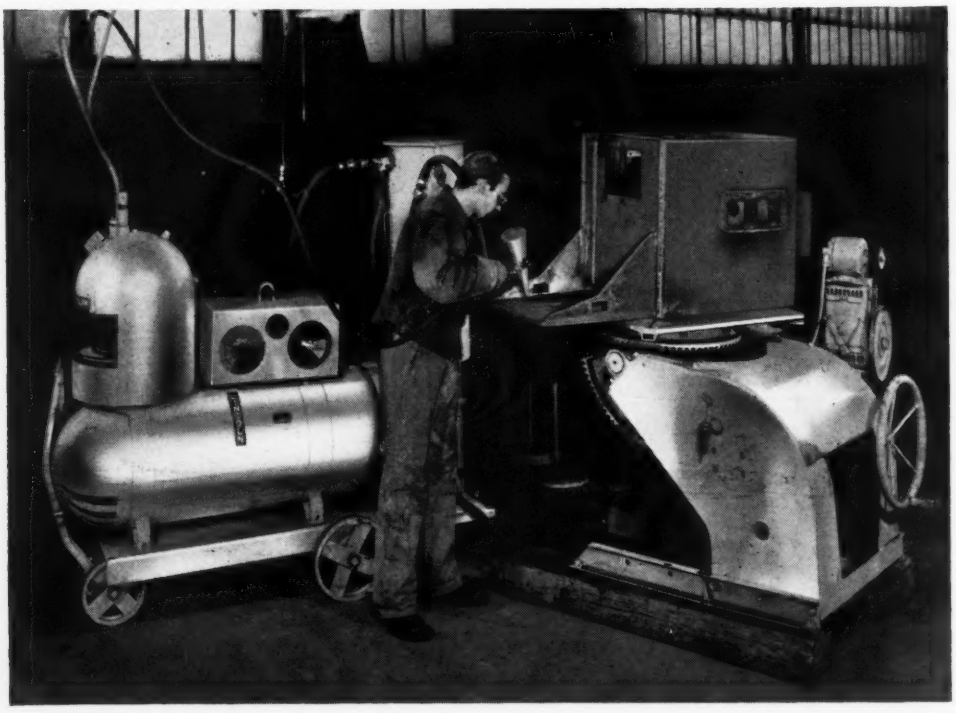
By EDWARD F. ARNTZEN, Sales Engineer and
WILLIAM LILLY, Welding Superintendent
A. C. Woods & Co., Rockford, Ill.

IN fabricating machine tool parts that have been designed for welded steel construction, the A. C. Woods & Co., Rockford, Ill., is employing manual hidden-arc welding equipment. Welding speeds six times as fast as those obtainable with hand welding methods have substantially increased production and reduced the cost of the weldments. The use of this equipment has also resulted in smooth, clean welds.

The illustration shows a typical manual hidden-arc welding operation being performed on a tank for a hydraulic pump that is to be installed on a machine tool. The welding unit, known as the "Manual Lincolnweld," is a recent product of the Lincoln Electric Co., Cleveland, Ohio. It is a portable, self-contained unit which provides all the necessary welding current and auxiliary power, and is equipped with an automatic wire-feed mechanism and controls. The basic element of the unit is a standard 600-ampere welder which can be used for either regular manual welding or for manual hidden-arc welding.

In "Manual Lincolnwelding," the electrode wire is fed automatically to the work through a granular flux which is deposited by gravity from the welding gun. The wire is fed from the reel and through a cable to the gun at the proper speed for the amount of current being used. The cable is made of rubber-covered stranded copper, in the center of which is a closely wound coil spring. This provides a light flexible carrier for both welding current and electrode wire. With this process, a 5/64-inch diameter electrode is used to provide ease of operation in manipulating the gun.

A constant arc voltage is automatically maintained, regardless of the height of the gun above the work. The gun can, therefore, be raised or lowered to regulate the flow of flux needed to cover the arc completely. With the 5/64-inch diameter electrode wire, extremely high current densities are used. As the wire is generally fed through the gun nozzle at about 300 inches per minute, and as current is introduced to the wire close to the arc, it is possible to use 600 amperes with a 5/64-inch electrode. In regular hand welding, a 3/8-inch electrode would be required to carry 600 amperes. The high current densities concentrate sufficient heat to weld 3/4-inch plate



Fabricating a Hydraulic-pump Tank for Application to a Machine Tool by Employing the Manual Hidden-arc Welding Process

Multiple Piercing Die Employed for Producing Thirty-six Slots in Motor Laminations at the Plant of the Reliance Electric and Engineering Co.

in a plain butt joint, one pass on each side, without edge preparation.

For the hydraulic-pump tank shown in the illustration, the welder is used in conjunction with a positioner. The sides of this open-top tank are made of 1/4-inch mild steel, the end plates of 1 1/8-inch plate, and the bottom of 1/2-inch plate. All parts are premachined and the assembly tack-welded together. The outside welds, except a few small outlet joints, are then made with the hidden-arc process. No edge preparation is required.

* * *

Multiple Piercing Dies for Motor Laminations

Use of multiple piercing dies to replace the notching method for making motor laminations is a comparatively new production technique at the Marine Division plant of the Reliance Electric & Engineering Co., Cleveland, Ohio. Economic justification for multiple piercing dies was based on a yearly production of laminations sufficient to result in savings that would pay for the dies in from two to three years. It was also found that each die freed four notching presses.

The die was designed to perforate slots in a blank previously formed in another operation. The blank for stator laminations is doughnut-shaped, while that for rotor laminations has the form of a disk. A nest is used to center or locate the blank in the multiple piercing die. Stator laminations are slotted and notched on the outside diameter, while rotor laminations are slotted and have a center hole punched out simultaneously. The operations are performed on a Minster 100-ton inclined, adjustable-speed press.

Segmental construction, with a shrink ring and a plug for holding the die segments together, is employed. Punch members are secured in place by a low-melting temperature lead-bismuth alloy having a negative coefficient of expansion, which firmly locks the punches in place in a retainer. Punch and retainer assemblies are so constructed as to permit composition compensation for wear by the removal of shim plates. In aligning the punch and die, a resin coating equivalent in thickness to the clearance between the punch and die is applied to the punch.

The working members of the dies are mounted in Meehanite die sets having four guide pins and bushings made of bronze and oil-lubricated. The dies have floating type positive knock-out strippers actuated by a cam built into the press. A delayed stripper action operates at the top of the press stroke, permitting each punching to fall clear of the nest.

These multiple-slot dies are made of high-carbon, high-chromium tool steel, hardened to Rockwell 63 to 64 C. They measure 20 by 20 inches. The lamination blanks are produced from high-silicon sheet steel of 26 gage (0.019 inch). They range in size from 4 3/4 inches in diameter for rotors to 12 1/8 inches for stators.

Although these dies are designed to produce five million punchings for a maximum grind of 1 inch of die length, experience shows that they exceed this life expectancy by a substantial margin. One die, for example, has already turned out more than eleven million punchings.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Graphitic Alloy Steel for Machine Bed Ways and Parts

A graphitic alloy steel that has been found to offer many properties advantageous in machine tool construction has been developed by the Timken Roller Bearing Co., Canton 6, Ohio. The presence of free graphite, as well as carbides, in its structure gives it a high resistance to wear and ability to retain lubricant. Improved machinability and freedom from scuffing and scoring are additional qualities that make it suitable for use in such applications as engine lathe ways, spindles, pump parts, and pneumatic hammer parts. This new Timken No. 91140 steel can be heat-treated with a minimum of distortion to obtain a wide range of physical properties...201

Zincilate Coatings Applied without Baking

Two new types of anti-corrosive "Zincilate" coatings that will air-dry without baking have been announced recently by Industrial Metal Protectives, Inc., Dayton 2, Ohio. After application of the new compounds, sheets, pipes, and forms can be bent double without breaking the coating. Coatings of enamel, paint, or other finishes can be applied over the Zincilate coating after five minutes of air drying, and both coatings can then be baked at the same time. The new coatings are adaptable to production-line application by dipping, spraying, brushing, or roller coating with conventional types of finishing equipment. 202

New Line of High-Speed Steels Brought out by Latrobe

The Latrobe Electric Steel Co., Latrobe, Pa., has begun commercial production of a new line of high-speed steels. Identified as the Electrite MV high-speed steel group, this line is distinguished by its chromium, molybdenum, and vanadium content, with no tungsten present. These high-speed steels are well adapted for applications that do not require the full properties of the more common tungsten-bearing high-speed steels; for example, they may be used for small drills and reamers; thread chasers, taps, pipe taps, etc.; woodworking knives and cutters; and body stock for carbide-tipped drills and reamers. Where applications of these steels are suitable, substantial economies may be effected because of their lower price. 203

Odorless Inhibitor Used for Sulphuric and Hydrochloric Acids

A liquid inhibitor that dissolves readily in acid solutions and is particularly useful where exhaust ventilation is not available has been announced by Enthone, Inc., 442 Elm St., New Haven, Conn., Department M. In solutions of both hydrochloric and sulphuric acids, the inhibiting action is over 90 per cent and in some cases is as high as 98 per cent. The inhibitor, known as Enthone inhibitor No. 9, dissolves cleanly in the acid solution, leaving no sludge or residue. Acid solutions, therefore, are easily rinsed off the work.

This inhibitor is suitable for use in both cold and hot pickles. Steel coated with scale, oxide, and rust can be quickly pickled without attack upon the base metal, so that bright surfaces remain bright after the pickling operations. A better base for plating or hot coating is also provided. 204

Two Liquid Adhesives for Cementing Metals, Plastics, and Wood

Two new modified phenolic liquid adhesives designed for cementing metals, thermosetting plastics, wood, fabric, or any combination of these have been placed on the market by the General Electric Co., Pittsfield, Mass. When properly cured, the new bonding agents, designated G-E adhesives Nos. 12507 and 12508, exhibit high shear and tensile strengths and exceptional resistance to water, gasoline, kerosene, and mineral oils. The adhesives are especially

useful for cementing metals and laminates, for preparing metal-faced sandwich type construction, for attaching brackets and lugs to thin metal sheets, and for the type of construction found in trailer walls, airplane fuselage walls, and the walls of prefabricated housing. The use of these adhesives eliminates the necessity for sanding plastics. 205

Skin Protection for Bright Metal Surfaces

Recently developed by the Dennis Chemical Co., 2700 Papin St., St. Louis, Mo., is a new protective liquid-plastic coating for polished or bright metal called "Redskin." The coating is applied by spray, brush, or dipping on the metal surfaces, and dries quickly, forming a tough, elastic film that is impervious to rust, chemical reaction, smears, or normal handling. To uncover the bright surface, an edge is picked up with the fingernail and the coating peeled off the entire surface in one continuous strip. 206

Removable Coating Compound for Spray Booths

A coating compound, known as "Triad PRD," has been developed for use on the walls of paint spray booths by the Detrex Corporation, Detroit 32, Mich. The compound facilitates maintenance of both wet and dry spray booths, but has characteristics that make it especially advantageous for use on the walls of dry booths.

It is a light-colored, semi-liquid material that is applied to the booth walls with a brush or spray gun and dries to form a continuous white coating to which paint overspray adheres. The coating of Triad PRD with the adherent paint film is readily scraped off without previous soaking, or it can be easily removed by flushing with either hot or cold water. Paint overspray adhering in a solid film can be peeled off in a sheet. 207

Low-Temperature Melting Silver Solder with High Shear Strength

A new silver solder having two exceptional advantages—a shear strength of 105,000 pounds per square inch and a melting temperature of only 1076 degrees F.—is announced by the All-State Welding Alloys Co., Inc., 96 W. Post Road, White Plains, N. Y. This alloy, known as All-State No. 111, is recommended for soldering high-speed steel tool tips with critical temperature ranges to shanks. The silver content of this alloy is 40 per cent, with the remainder made up of cadmium, copper, and zinc. 208

Aluminum-Bronze Alloy Developed for Cold-Heading Operations

An aluminum-bronze alloy, designated Ampcoloy 49, has been developed by Ampco Metal, Inc., Milwaukee 4, Wis., for cold-heading. The new alloy has a high tensile strength, which is still further increased by cold-working; a higher resistance to wear than ordinary bronze; high fatigue and impact values; and good corrosion resistance. In addition to being suitable for the production of cold-headed bolts, rivets, screws, and all types of fastenings, it makes an excellent spring material. 209

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on these pages, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in June, 1948, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on the blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME.....POSITION OR TITLE.....
[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

CITY.....STATE.....

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Lustrous Chromium Plating

A. J. K.—We recently obtained a contract to fabricate and plate some aluminum hardware parts. Specifications call for a "lustrous" chromium finish. Can this be obtained by plating directly on a coat of zinc or will a second coat of copper or nickel be necessary? Information on the nickel-plating procedure would be appreciated.

A.—To obtain a lustrous finish, chromium must be plated over buffed copper, brass, or nickel. A common finish consists of successive coats of copper, nickel, and chromium. However, this may not be necessary.

Nickel can be applied either on a zincated or on an anodized surface. The suggested procedure is as follows:

1. Rinse the part thoroughly after the anodizing or zincating treatment.
2. Immerse in a solution consisting of 30 to 40 ounces of nickel salts, 5 ounces of boric acid, and 7 to 8 ounces of nickel chloride to 1 gallon of water. The temperature of the solution should be maintained at from 120 to 160 degrees F.; the voltage, from 4 to 6 volts direct current; and the current density, from 20 to 40 amperes per square foot; the higher current densities can be used if the work or solution is agitated.
3. Rinse first in cold and then in hot water; dry and buff.
4. Chromium-plate.

Incidentally, patents on chromium plating are held by United Chromium, Inc.

Validity of Exclusive Agency Contracts

N. R. M.—Is a contract valid that gives an agent the exclusive right to sell machinery in a certain territory or city? Would such a contract be valid if it contained no date of termination?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

A contract without a definite duration is void. For example, in International Co. v. Lacy [53 N.E. (2d) 636], it was shown that a manufacturing company's representative verbally promised the exclusive agency to a purchaser and agreed to put the contract in writing, which never was done. The higher Court held that no valid exclusive agency contract existed, and said:

"It (the company) did not agree to continue exclusive representation once commenced for any certain time, nor under any certain conditions. It could hardly have been within the contemplation of the parties that appellee (the buyer) should have the exclusive right to retail appellant's (the company's) merchandise forever."

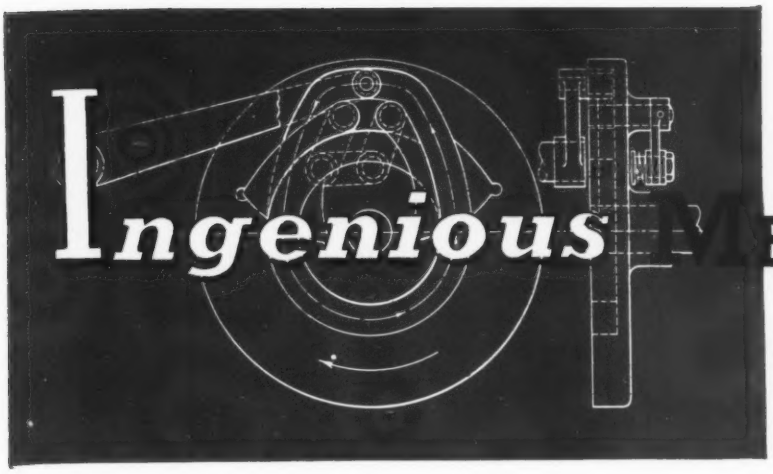
Therefore, an exclusive agency contract which fails to include the duration of the contract is void. On the other hand, an exclusive agency contract is valid if such contract: (1) is properly signed; (2) states a definite duration; (3) specifies the price of the merchandise; and (4) is agreed to, as regards definite obligation, by both parties.

Type of Shear for Punches Used in Making Slots in Heavy Steel Plate

The editor of *Nickel Steel Topics* made some pertinent remarks in the February number of MACHINERY in reply to a question on how to increase the life of punches used for punching 1/2- by 3-inch rectangular slots in mild steel plates. I agree with the answer in everything with one exception—that is, the recommendation that a scalloped shear should be ground on the punch.

We found during the war at our Cleveland plant, and since the war at our Battle Creek plant, that a 90-degree chisel point shear on all types of punches, (round, square, elliptical, or rectangular) requires substantially less press tonnage for piercing and greatly increases the punch life. A scallop or concave shear has been found to cause punches to split up through the sized portion of the punch.

H. L. GOOCH, Tool Engineer
The Oliver Corporation
Battle Creek, Mich.



Ingenious MECHANISMS

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

Oscillating Cam Made Adjustable

By L. KASPER

On a recently designed automatic drilling machine, the work-holding fixture is operated by pneumatic cylinders. Compressed air is admitted to or discharged from the cylinders by means of a plunger valve operated by a cam supported on an oscillating shaft. For various types of work and different operations, it was necessary to provide some means of adjusting the timing for the application or release of the air pressure. The adjustable oscillating cam illustrated was designed for this purpose.

As shown in Fig. 1, plate *B* is clamped to and oscillates with shaft *A*. Cam-plate *E* is free to swing about the common center line of the plate and shaft, since it is loosely mounted on a hub of plate *B*. Fiber plates *C* (located between plates *B* and *E*) and plate *D* (on the outside face of plate *E*) are mounted on studs *H*. These studs are pressed into holes in plate *B* and pass through slots in cam-plate *E*.

Springs located between washers on the studs can be compressed by tightening the nuts. This causes the cam-plate to oscillate with plate *B*, the amount of oscillation being controlled by adjustable stops *G* and *J*.

Roller *F*, which is pinned to the plunger of the pneumatic valve, is shown in contact with the rise of cam *E* in Fig. 1. Movement of shaft *A* in the direction indicated by the arrow will cause the plunger to be depressed, thus permitting air to enter the cylinders. Further movement of the cam to the left is limited by stop *J*.

Referring to Fig. 2, as cam-plate *E* moves to the right, the valve plunger is depressed. When the cam-plate comes in contact with stop *G*, further movement of the plate is prevented, regardless of the extent to which the shaft is oscillated. Then when the movement of the shaft is re-

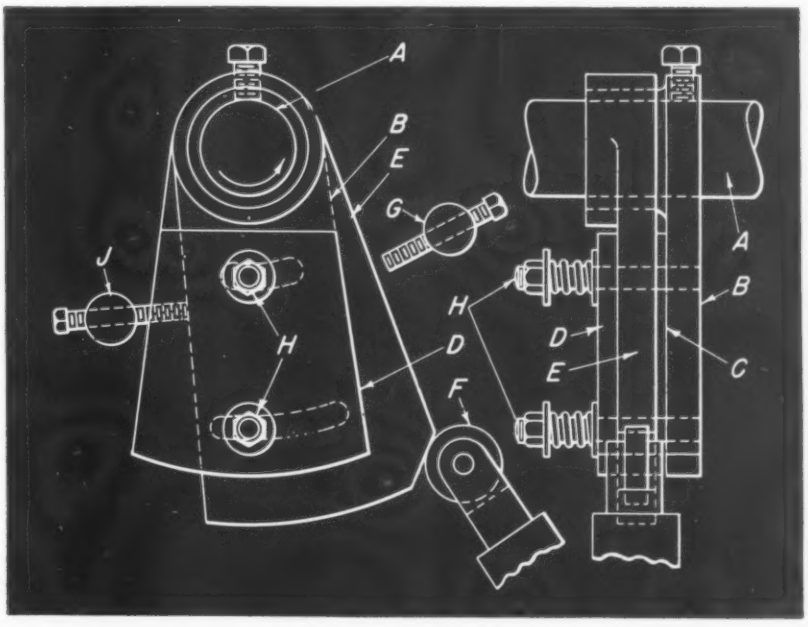


Fig. 1. Arrangement of an Adjustable Oscillating Cam which Controls the Admission or Discharge of Air to a Pneumatic Cylinder that Actuates a Work-holding Fixture. The Amount of Oscillation of Cam-plate E Can be Adjusted by Stop-screws G and J

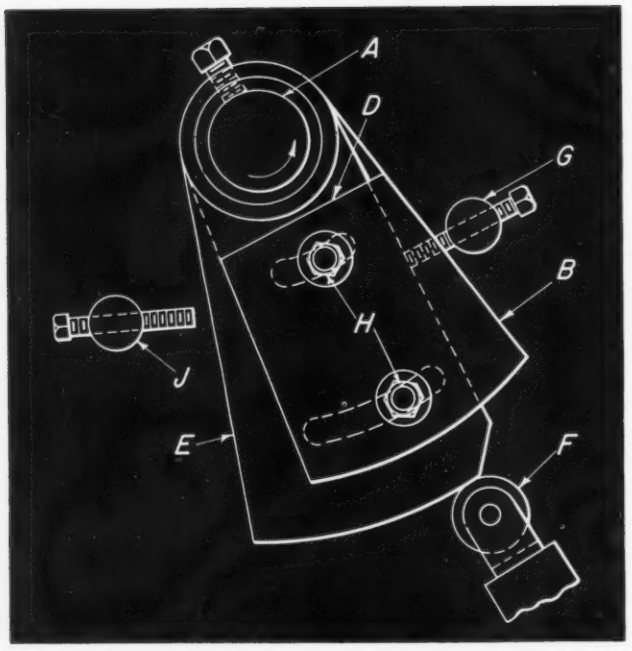


Fig. 2. Cam-plate E, Fig. 1, after having Moved to the Right; in This Position the Valve Plunger is Depressed and Air is Admitted to the Cylinder

versed, plate *E* returns to the position shown in Fig. 1 and the valve is closed.

In this manner, the work-holding clamps are closed at the beginning of the first half of the cycle and released at the start of the second half of the cycle. Timing for the application or release of air pressure can be varied by adjusting the stop-screws. For example, if it is desired to open the valve later, the screw in stop *J* is backed off, thus causing a time lag before the valve is open. Similarly, the screw in stop *G* can be backed off to permit later closing.

Mechanism Designed to Crimp Ends of Heavy Paper Cylinder

By FRANK HARTLEY

The lever and toggle action mechanism shown in the assembly view, Fig. 2, is designed to crimp the upper end of a heavy paper cylinder *B*, Fig. 1, for a length *C* preparatory to folding and flattening it over the end of an inside core or spool of twine *A*. After the paper has been folded over the twine, it is secured in place by cementing a circular label over the end.

To enable the end of the paper cylinder to be satisfactorily folded and flattened, the mechanism was designed to produce twelve crimps, equally spaced about its circumference, as shown in the plan view of Fig. 1. This required twelve individual toggle units, arranged in a circle around a central operating unit. Two of the toggle units are shown in the closed position at the left of the illustration Fig. 2, while one is shown in the open position by the sectional view at the right.

The spool *X*, Fig. 2, is lightly clamped in position, with the paper cylinder extending a distance *Z* beyond its upper end. The clamping means employed consists of a V-clamp *A* which slides on two tightening rods *B*, only one of which is shown. The tightening rods, with the spool located between them, pass through the frame of the mechanism and are fitted with clamping nuts. While the work is being clamped in place, the lever-shaped jaws *C* and *D* move upward, clearing the spool and paper, as shown in the sectional view at the right.

The entire unit then moves down to the lower position shown at the left, but with the jaws *C* and *D* held open. These jaws are next closed around the end of the paper cylinder, crimping

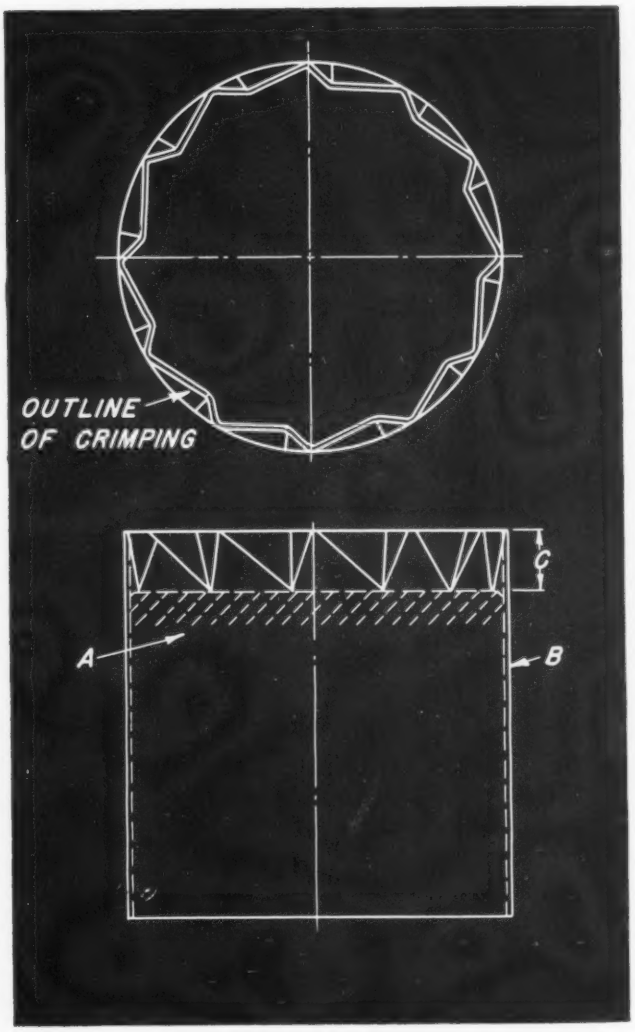


Fig. 1. Plan and Side Views of Heavy Paper Cylinder, Showing Twelve Equally Spaced Crimps Produced by Mechanism Shown in Fig. 2

it in twelve places, as required. After this has been accomplished, it is a simple matter to fold over the end of the paper and flatten it down into place to receive the label.

Referring to the construction of the mechanism, housing *E* is a drum-shaped part to which is attached a series of brackets *F*. In the illustration, the drum is cut through the center to show two of the twelve units *C* and *D*. Each of these units is pivoted on its own stud *Q* in the drum. The twelve angular extended ends *G* of levers *D* enter a groove in yoke *H* that is free to slide over the central shaft *J*. The central shaft has a pad *K* attached to the lower end which holds the spool down and acts as a control center.

The lever-shaped jaws *C* have straight extended ends *L* to which are attached, by means of connecting links *M*, a series of twelve right-angle levers *N*, all of which engage the groove in yoke *P*. Yoke *P* operates jaws *C*, bringing them into the open or closed position, while yoke *H* operates jaws *D;* thus the simultaneous action of the two series of jaws serves to crimp the circumference of the heavy paper. Two rods *R* attached to an operating mechanism within the machine serve to slide the yoke *P* up and down on the central shaft *J*. In a similar manner, two rods *S* operate the yoke *H*.

With the spool and paper cylinder clamped in place, the central shaft *J* moves down until pad *K* touches the spool. As this is done, the entire unit carried on drum *E* moves down into position. Jaws *C* are then closed by yoke *P*, after which jaws *D* are closed as yoke *H* slides along the shaft from the open to the closed position.

* * *

Expansion in the steel industry completed in the past year or scheduled for completion in 1948 and 1949 will add over 5,000,000 tons to the steel ingot capacity of the country.

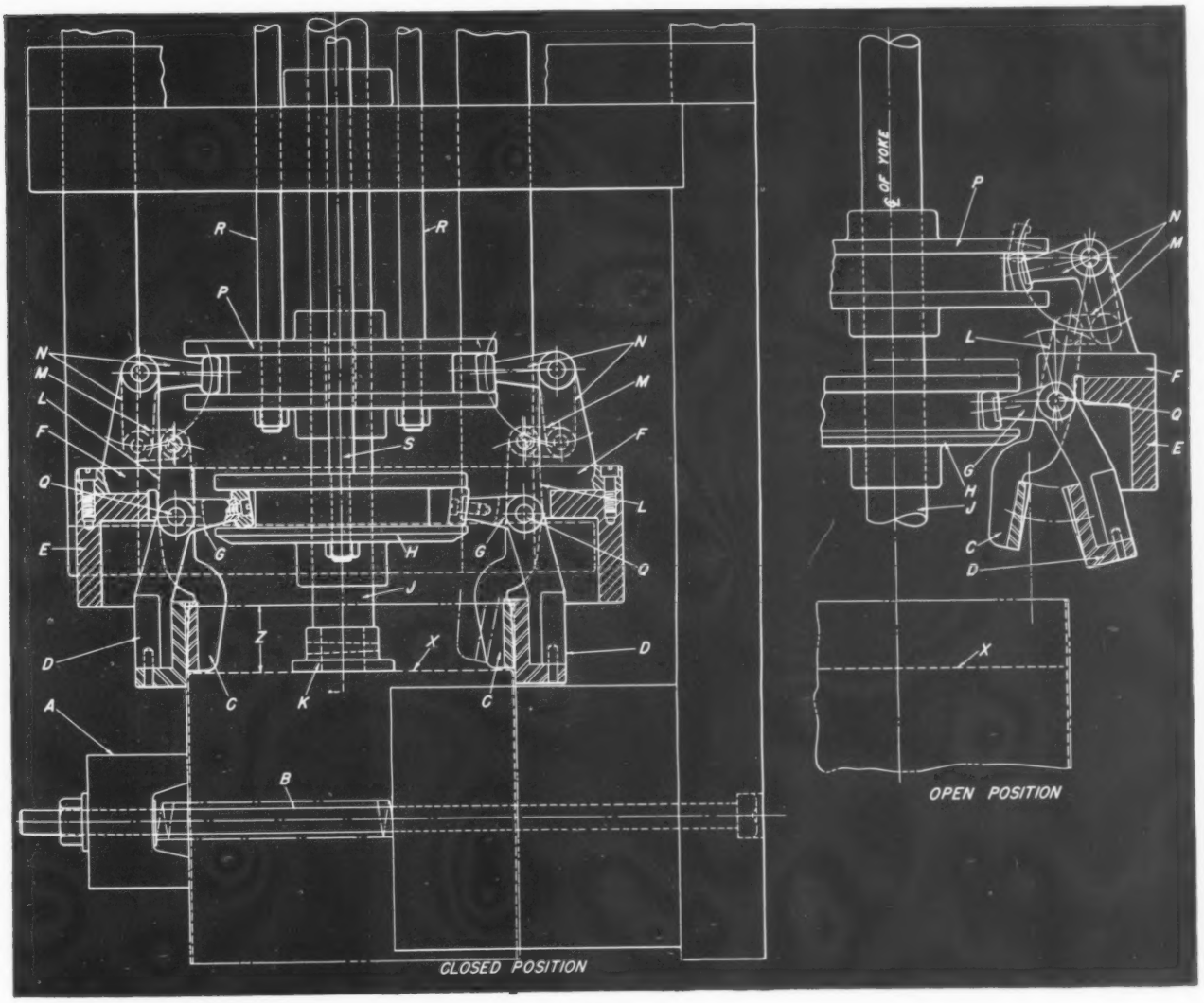


Fig. 2. Mechanism Designed to Crimp Ends of Heavy Paper Cylinders as Indicated in Fig. 1 Preparatory to Folding and Flattening the Paper over the End of a Spool of Twine

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

A Simple Set-Up for Turning Concave Surfaces

By CLIFFORD T. BOWER, Decatur, Ga.

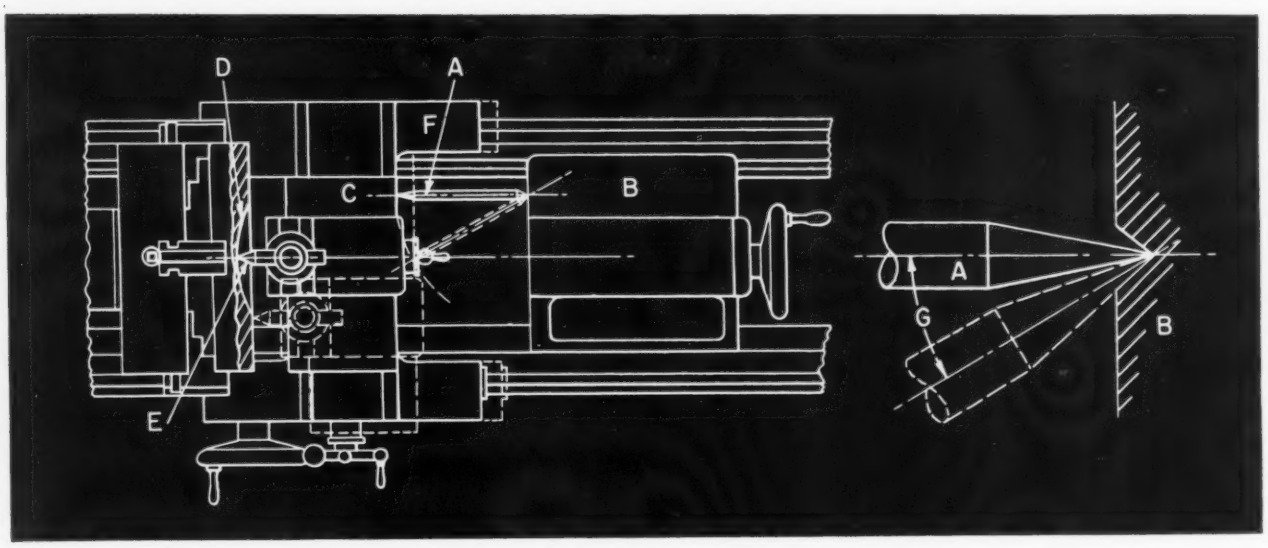
Many complicated arrangements have been developed for turning spherical surfaces on lathes and other machine tools. The larger the number of moving parts or connections in such arrangements, the greater the chance for inaccuracies in the finished work. The simple arrangement shown in the accompanying illustration requires a minimum of parts and only minor modifications in the lathe to enable concave surfaces to be turned to various radii.

The pin *A* is made equal in length to the desired radius, different pins being substituted to suit the radius of the work to be turned. One end of the pin is set into a dimple drilled in the face of the tailstock casting *B*, while the opposite end rests in a dimple in the cross-slide casting *C*. The operator simply feeds the tool to depth at the forward edge of the concave surface *D* to be machined, as shown by the broken lines, and engages the cross-feed. During the traverse of the cross-slide, the tool *E* and entire carriage *F* are automatically moved toward the work by the pin *A*, thus generating the desired spherical surface. The cutting pressure will keep the pin seated in the dimples.

The dimples must be drilled in a plane parallel with the top of the lathe bed in order to generate an accurate concave surface of the desired radius. The transverse location of the dimple is relatively unimportant, except that the approximate positions shown have been found most suitable for obtaining a large range of concave surfaces.

At the completion of the cut, the center line of the tool should be in line with the center line of the spindle and work and the pin should be parallel to these center lines, as shown. Also, the cutting point of the tool must be at the same height as the center line of the spindle and work.

This arrangement is best suited for generating relatively large concave surfaces in rough castings. The arc that can be cut is limited to twice the angle *G* shown in the enlarged section at the right of the illustration. As a general rule, the maximum included angle of arc that can be safely generated is about 60 degrees when the included angle of the dimple is 90 degrees.



Simple Method of Turning Concave Surfaces on a Lathe. The Length of Pin A, Held between Tailstock B and the Cross-slide Casting C, Determines the Radius of the Concave Surface

New Die Frame Design that Saves Labor and Material

By ROBERT MAWSON, Providence, R. I.

A sectional die frame that can be machined and assembled in about 60 per cent less time than is required to make a conventional steel frame has been designed and applied to sheet-metal dies by the Morris Machine & Tool Co., Providence, R. I. This frame also has the advantages of requiring less material in its construction, and of being easier to repair in case of damage.

An ordinary die frame, shown at *X* in the accompanying illustration, is machined from a solid steel plate. The opening in the center must first be laid out; then holes are drilled along the lay-out lines, and the material between these holes is cut with a saw, so that the center block can be removed. Finally, the edges along the cut are milled to the desired shape.

The outer edges must also be milled to size, the holes for the bolts that hold the die drilled and tapped, and the top and bottom faces ground flat. To perform these operations on a die frame such as illustrated (which is 2 1/2 inches deep), would require about thirty to thirty-two hours man time. Furthermore, if the frame were damaged on the press, it probably would be a total loss.

Because of the time required for this procedure, the die frame illustrated at *Y* was developed. This frame is made in four sections and held together by interlocking corners. The sections can readily be cut to shape on a DoAll saw, leaving only a small amount of material for subsequent fitting operations. Little material is wasted by this procedure, and the four sections are held rigidly in place against strains from all directions. The rigidity of the construction will be evident from the fact that one die frame of this type was used to draw sheet steel under a pressure of 300 tons.

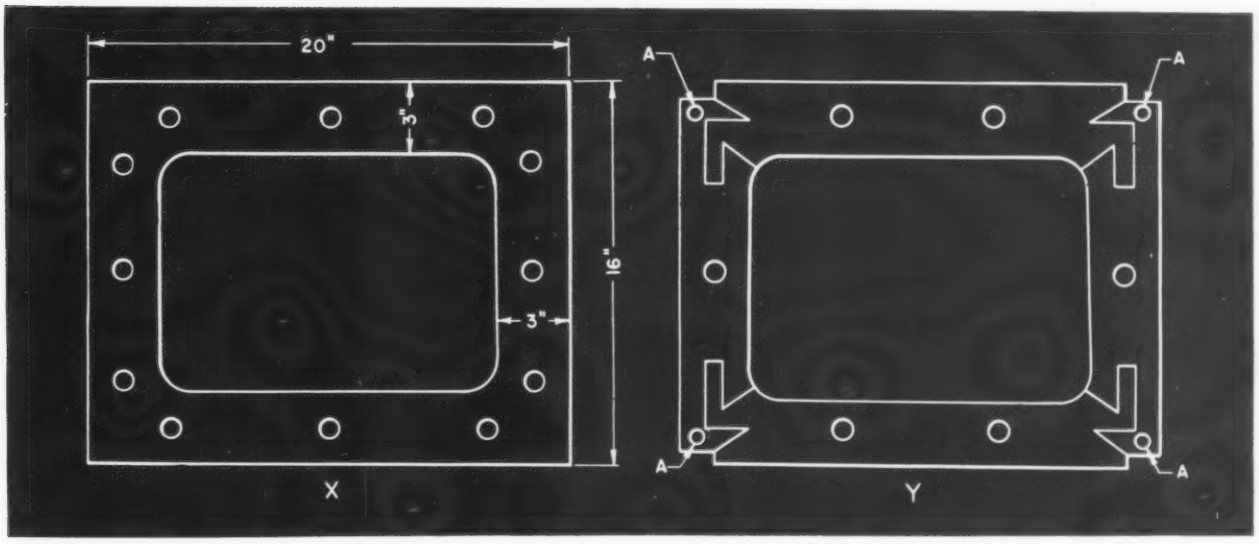
The frame is attached to the die by a 1/2-inch pin *A* at each corner. With this method of attaching the units, an accident on the press results only in shearing one or more of the pins, and leaves the frame uninjured. But it can readily be seen that, even though the die-holder were damaged, only one or two sections would be affected, and the cost of making these sections would be much less than that of making a complete die frame. The time necessary to complete a sectional frame is approximately twelve hours.

Novel Thrust Shoulder for Grinding-Wheel Spindle

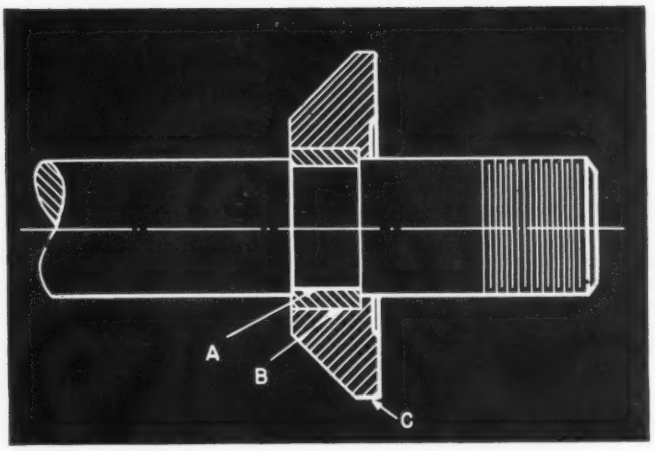
By DONALD A. BAKER, Boonton, N. J.

Frequently it is necessary to machine shoulders as locating or stopping points for gears, cranks, collars, etc. The customary practice is to turn down a portion of the shaft to form a shoulder or to fasten collars in place with pins or set-screws. However, there are times when neither of these methods is practicable.

One such case involved the grinding-wheel spindle for a special machine. In designing the machine, it was decided to use some bearings and spindles from obsolete equipment. These



An Ordinary Die Frame X and a Sectional Frame Y which can be Made Quicker and with Less Material than was Previously Possible



Collar B, Acting as a Thrust Shoulder, is Pressed in Place on a Shaft and Does Not Need Pins or Set-screws to Hold it in Place, nor Does It Require an Appreciable Reduction in the Spindle Diameter

spindles were 1 inch in diameter and were unthreaded; the grinding wheels in stock and those available from outside suppliers had a 1-inch hole. To avoid turning down the end of the spindle to a smaller size than the diameter of the hole in the grinding wheel, the following procedure was adopted.

First the ends of the spindles were drilled and bored in a lathe to the standard 60 degrees for centers, the work being supported by a steady-rest. Then the spindles were threaded and a shallow groove, 1/32 inch deep by 1/2 inch wide, was turned at *A*. Next a collar *B* was turned with an inside diameter 0.001 inch smaller than the diameter of groove *A* and an outside diameter approximately 1/8 inch larger than the shaft diameter. After being turned to size, the collar was cut in half with a hacksaw so that it could be slipped into the groove. Finally, the wheel flange *C* was turned, faced, and bored to two diameters, the smaller diameter being a slip fit over the shaft and the larger being 0.001 or 0.002 inch smaller than the outside diameter of collar *B*. When the flange was pressed in place over the collar, the collar acted as a shoulder capable of taking a heavy thrust load, if necessary, and did not require cutting down the machine spindle to any extent.

* * *

Boring a Series of Holes at a Compound Angle

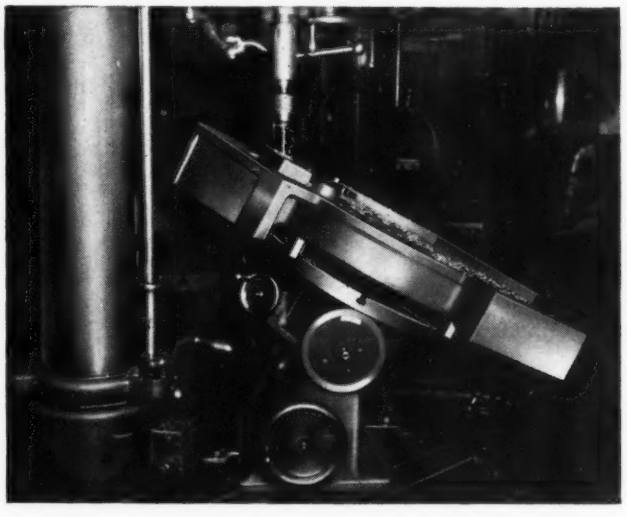
Boring a series of holes at a compound angle is, in itself, a problem, but when such a task must be done in a heavy, unwieldy base, the job is especially difficult. A Michigan manufacturer found a new ingenious and accurate way to do the work, which reduced the time to one-half that previously required. The job consisted of boring twenty 1/2-inch holes at a compound angle in a fabricated base 42 inches square by 8 inches thick, which weighed 865 pounds.

The accompanying illustration shows how the work was handled on a radial drilling machine by mounting the base on a standard 24-inch "Rotab" fixture made by the Machine Products Corporation, Detroit, Mich. The initial set-up was made on the faceplate, after which the fixture was tilted to the proper angle and the work indexed to the correct positions for drilling the various holes, using the worm mechanism and reading the graduations on the vernier dial.

* * *

Steel Scrap Drive of Anti-Friction Bearing Plants Has Successful Results

An industry-wide scrap drive carried out by ball and roller bearing manufacturers has boosted the nation's dwindling scrap pile by more than 25,000 tons. This scrap was in addition to the scrap produced in the normal course of manufacture. It constituted obsolete machinery, tools broken beyond repair, and old metal uncovered in factory house-cleaning. Some manufacturers used special teams of employes to tour plants and grounds in search of scrap, and appeals for cooperation were made by means of the company's advertising and plant bulletins.



Set-up for Boring a Series of Holes at a Compound Angle, Using a "Rotab" Welding Fixture

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER Sales Engineering Consultant

The Sales Engineer Should Look at Himself

AFTER the sales engineer had left, the purchasing engineer turned to a companion. "That fellow knows his business," he remarked, "and he is a nice fellow too. I like him."

In this instance, the sales engineer had made a good impression. Not only did he know his apparatus and its use, as well as his customer's problems, but his make-up and actions had pleased the purchasing engineer. Facts had been interpreted through personality. His appearance, his manner—in fact the way he shaped and timed the expression of ideas—all had "clicked."

The salesman is generally classed as an extrovert. His mind turns outward rather than inward. But should not the sales engineer take time out now and then to study himself and his reactions on others?

What are some of the factors in the sales engineer's make-up that go so far to give warmth and meaning to dry details and gain consideration? The radio announcer depends only on vocal expression. The model rests her case on her form and appearance. But the sales engineer has at his command a wide range of attributes that affect personal relationship.

Perhaps the most important of these attributes is sincerity. No amount of instruction in how to appear, act, and speak can help the sales engineer unless he is sincere. Canned talk, the rehearsed act, the sketched pose—these may fool the shallow mind and gain momentary attention. They may serve the purpose of a "one-time" salesman—the false framework prepared for a one-shot movie.

The problem of getting along successfully with people and gaining favorable reaction boils down to first gaining a real interest in helping customers, and second, developing the strong points of one's personality and suppressing the weak ones. Through personal analysis, experience, and practice, the successful sales engineer is soon able to develop sound habits. Performance then becomes subconscious. The mind, flushed with enthusiasm and supported by sincerity, focusses its attention entirely on the problem at hand.

Now let us consider the sales engineer in the presence of the purchasing engineer and cite some details that really count. To begin with, cleanliness and neatness in person and dress are essential. Extremes in attire are to be avoided; they may impress, but usually unfavorably.

The sales engineer should train himself to avoid distracting mannerisms, such as fingering objects, continually stroking the face, swaying back and forth. Many of us have our pet little habits of working off suppressed nervous energy, but usually they are diverting and detract rather than add. The eyes are apt to roam about the room rather than be fixed most of the time upon the person to whom we are talking. Sometimes the voice is too loud and commanding—other times too feeble to be heard and understood. Some of us sit rigid, others move with restless anxiety, while still others may even assume a lounging posture.

The personal attitude is important. With some of us the matter of sincerity finds its only expression in solemnity. A pleasant manner, persistently followed, is usually catching. There is nothing like a touch of natural humor, introduced at the right moment, to color and sweeten the personal interview.

"Name memory" is another important asset to the sales engineer. Mention the name of the man you are speaking to. Repeat it quite frequently, for this not only lends a personal touch to your remarks, but helps register it in your mind.

We speak of "getting under the purchaser's skin." Some sales engineers fail because they try to do this at one stroke. Undue familiarity may breed contempt—yet isolated dignity blocks

the wheels of friendship on which business rides our way.

And then there is the power of silence. Many buyers complain of "too much chatter" from salesmen. Often the mind runs away and leaves the mouth at work. Most people like to talk. But a good listener can get ideas to use when his turn comes. Above all, by not interrupting the speaker, the sales engineer has a remarkably good chance to size up his man and plan the strategy for further action.

Exaggerated remarks by a sales engineer regarding his product often do more harm than good. The "under statement," so characteristic of the English, is sometimes very effective. Recently I was told of a machine tool sales engineer who was asked whether his machine was the best on the market. "No," he answered, smilingly, "it is the second best. Each one of my competitors says his is the best, but mine is always mentioned as second best."

Thus, in touching on only a few factors of personality in selling, it becomes clear that balance and flexibility are two important characteristics of the sales engineer. For after all, must not the sales engineer, to be successful, learn the art of balance and control and the skill of adaptability to the immediate situation at hand?

* * *

Ten-Point Program for Successful Selling

Here is a ten-point program for sales executives, as outlined by Gale F. Johnston, president, Mercantile-Commerce Bank & Trust Co., St. Louis, Mo.:

1. Know your markets more thoroughly.
2. Insist that your products meet quality standards.
3. Put your distribution pipe-lines in first-class shape.
4. Tighten pricing policies.
5. Scrutinize your costs.
6. Improve services to customers.
7. Tailor your advertising and sales-promotion programs to actual needs—both short range and for the long pull.
8. Develop a more effective, hard-hitting sales force.
9. Give salesmanship all you've got.
10. Place greater emphasis on public relations.

* * *

According to the United States Department of Labor, over 2,000,000 disabling work injuries were suffered in this country during 1947.

Magnesium Alloys Can Now be Plated

Electrodeposits of various metals, such as chromium, silver, gold, copper, brass, cadmium, and zinc, can now be applied to any commercial magnesium alloy. The initial stages in plating magnesium are to remove contamination and provide a reactive surface. This treatment is followed by a bath which deposits a thin zinc film on the surface of the magnesium. From this point on, all plating is done in commercially used baths, and is typical of the practice followed in plating a variety of finishes on any other metal.

Excellent adhesion, wear, and resistance to accelerated corrosion have been obtained. While preliminary tests have indicated satisfactory corrosion resistance, it is recommended that exterior uses involving severe exposures be given tests under actual conditions of use. The plating process is commercially available under license granted by the Dow Chemical Co., Midland, Mich.

* * *

Foundry Training Program Established by Massachusetts Institute of Technology

Announcement has been made of the establishment at the Massachusetts Institute of Technology of a foundry program, combined with the courses in metallurgy, mechanical engineering, and business administration to meet the demands for professional training for the foundry industry. The recent war disclosed the great need for college-trained men in the foundry industry, and the various foundry, trade, and technical associations have indicated their intention of supporting a broad program of training at the institutions of higher learning. Grants have been made by the Foundry Educational Foundation for the purchase of the required equipment and the establishment of scholarships.

Further information can be obtained from John J. Rowlands, Director of News Service, Massachusetts Institute of Technology, Cambridge, Mass.

* * *

The business of designing new automobiles has reached huge proportions. One large company has nine design studios employing hundreds of artists and skilled craftsmen. They work with plastic, metal, wood, clay, glass, rubber, fabrics, and lacquers to build small and actual size models of new cars. From the conception of the new model to production on the assembly line usually takes about two years.

Shop Equipment News

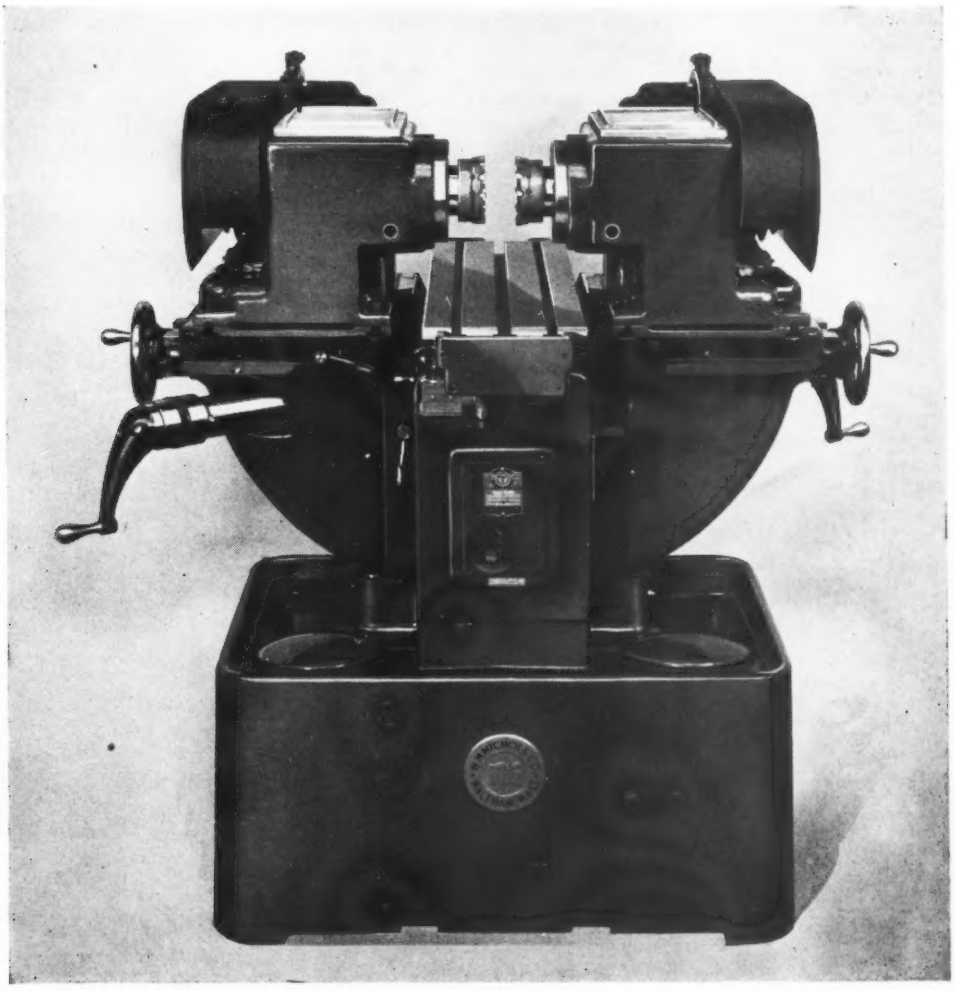
Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Nichols Double-Spindle Precision Milling Machine

A double-spindle precision milling machine of exceptional versatility, called the "Twin Miller," has just been announced by the W. H. Nichols Co., Waltham 54, Mass. This new machine is especially adapted for light-duty precision milling operations on work that permits two parallel surfaces to be machined in a single pass of the table. The spindles of the two opposed independently geared milling heads are driven by pancake type motors. Belt and gear drives are arranged to provide fifteen speeds for each spindle within a range of from 55 to 2080 R.P.M.

Both milling heads are adjustable in three planes, horizontal adjustment being obtained by slides and set-screws, while vertical and transverse adjustments are secured by feed-screws with direct-reading micrometer dials. The maximum adjustment of the spindle center above the table is 12 inches, and the minimum adjustment 1 1/2 inches. The maximum distance between spindle noses across the table is 16 inches, and the minimum distance 4 inches.

Vertical attachments can be fitted to either spindle or to both spindles, thus making it possible to machine one vertical and one horizontal surface at one pass of the table or two vertical or two



"Twin Miller" Adapted for Light-duty Precision Work, Brought out by the W. H. Nichols Co.

To obtain additional information on equipment described on this page, see lower part of page 234.

horizontal surfaces in one traversing movement. Independent adjustment of the heads also permits offset milling in either the vertical or horizontal position.

The table has a working surface of 8 1/2 by 4 inches, and is actuated by a solenoid-operated air cylinder. It has a maximum travel of 12 inches with a hydraulically controlled cutting stroke of 9 inches. The machine has an over-all height of 55 inches, requires a floor space of 48 by 60 inches, and weighs approximately 1750 pounds. The 1745-R.P.M., 1-H.P. alternating-current, 60-cycle motors with which this machine is equipped are of the reversible type. 61

Verson Double-Action Deep-Drawing Press

Two principles of force application—mechanical and hydraulic—have been combined in the new Type MH double-action deep-drawing press developed by the Verson Allsteel Press Co., 1355 E. 93rd St., Chicago 19, Ill. This press has been designed to obtain the high productive capacity of the mechanical drawing press plus the adjustable blank-holder features of hydraulic presses.

Among the advantages claimed for this design are increased production on deep-draw work; instantaneous adjustment of pressure by valves and direct-reading gages at any pressure point on the blank-holder; and a blank-holder that is self-adjusting for any thickness of stock.

These presses can be converted quickly from double-action to single-action work. The cycle, including the delayed-action return of the bed cushions, is fully automatic. This type of press is available in a wide range of bed sizes and tonnage capacities. 62

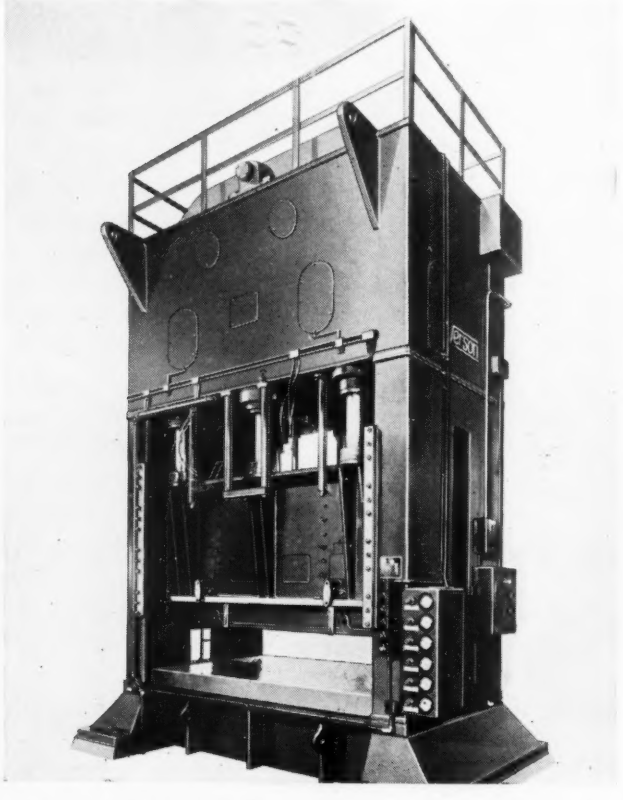
Hoern & Dilts Boring Machine Designed to Use Carboloy Boring-Bars

Hoern & Dilts, Inc., 925 Rust Avenue, Saginaw, Mich., have brought out a high-production precision boring machine designed specifically for the use of the solid cemented-carbide boring-bars recently developed by Carboloy Company, Inc. This new five-station, ten-spindle machine has a Carboloy boring-bar in each work-spindle. Standard carbide boring bits are inserted in each boring-bar.

The head of the machine is pentagonal, each side carrying two boring-bars. In operation, the head and work-table revolve continuously. The work-spindles stop revolving at the loading station and the boring-bars retract. When the loading station has been passed, the spindles automatically start again.

The spindle and work-table speeds are changed by means of interchangeable V-belt pulleys. The spindle is driven by a 10-H.P. 1800-R.P.M. motor and the table by a 2-H.P. motor. The machine has a maximum outside diameter capacity of 6 inches, and a minimum inside diameter of 1/4 inch. The maximum boring depth is 5 inches.

Operation of the tool-slide is through a master cam mounted on the machine column. Intermediate cams control the in-feed or retracting radial movements of the tools. Graduated micrometer dials on each tool-slide permit readjustment of the tool setting while the machine is in use.....63



Mechanical-hydraulic Double-action Deep-drawing Press Built by Verson Allsteel Press Co.

Hoern & Dilts Ten-spindle Precision Boring Machine Designed to Use Cemented-carbide Boring-bars

To obtain additional information on equipment described on this page, see lower part of page 234.

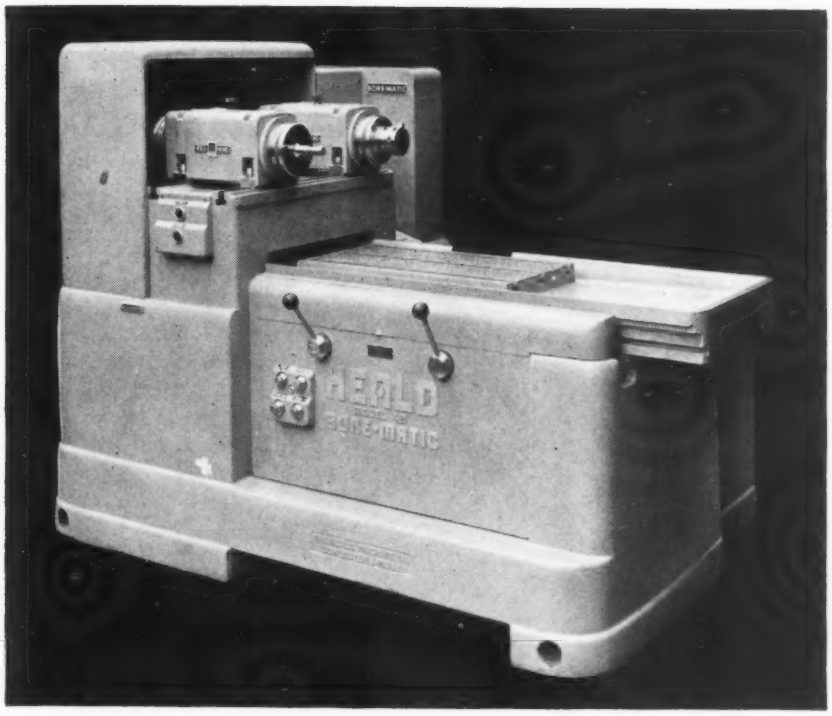


Fig. 1. Heald Single-end Bore-Matic

Heald Single- and Double-End Bore-Matics

The Heald Machine Co., Worcester 6, Mass., has announced two new Bore-Matic machines of single- and double-end design, shown in Figs. 1 and 2, respectively. These Models 421 and 422 machines are designed to meet the demand for a large standard machine capable of handling heavy work, thus eliminating the need for special out-size equipment. Like all Heald Bore-Matics, these machines will perform boring, turning, chamfering, grooving, facing, or fly-cutting operations either separately or in any desired combination. Adequate power—up to 10 H.P.—is available at each spindle for heavy roughing cuts and the higher speeds used for multiple heads.

Permanently lubricated boring heads; a low-temperature hydraulic system; uniform hydraulic feeds; convenient operation; fast automatic cycles; smooth table motion; isolation of motor vibration; hydraulic attachments for operation of fixtures, cross-slides, chucks, etc.; provision for two-way boring; adjustable brake timing, versatile hydraulic control; and full control of chips and cutting fluid are outstanding features.

The machines have a bridge width of 31 1/4 inches and a maximum table travel of 20 inches. The table pad is 15 by 27 inches, and the width of the table is 21 5/8 inches. The distance from the top of the table to the floor is 33 inches and to the top of the bridges, 8 inches. Table feeds have a fast range for "in" feed only of 1/2 inch to 50 inches per minute, a slow range for "in" feed, "out" feed, or both, of 1/2 to 40 inches per minute, and a rapid table traverse of 23 feet per minute. Head-drive motors of 5 H.P., 1200 R.P.M. are standard, but 7 1/2-H.P., 1200-R.P.M. or 10-H.P., 1800-R.P.M. motors can be furnished.

The single-end machine, has a distance from bridge to end of table pad of 40 3/4 inches, requires a floor space of 93 1/4 by 53 inches without the cutting fluid tank, and weighs 6900 pounds. The double-end machine has a distance between bridges ranging from 34 1/2 to 46 1/2 inches, requires a floor space of 96 by 53 inches, and weighs about 8900 pounds. 64

Westinghouse Stainless-Steel Electrodes

Twenty-seven new Flexarc stainless-steel electrodes made in a complete range of types and seven diameters, from 1/16 to 1/4 inch, for welding all commercial grades of chromium, nickel, and straight chromium steel are available from the Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. These electrodes are produced in two types, a combination titania-lime type coating for welding with alternating current and direct current reverse polarity; and a straight lime type coating for welding with direct current reverse polarity only.

Each of these types is suitable for welding in all positions. Characteristics of these electrodes are fine smooth bead finish with relatively flat contour. 65

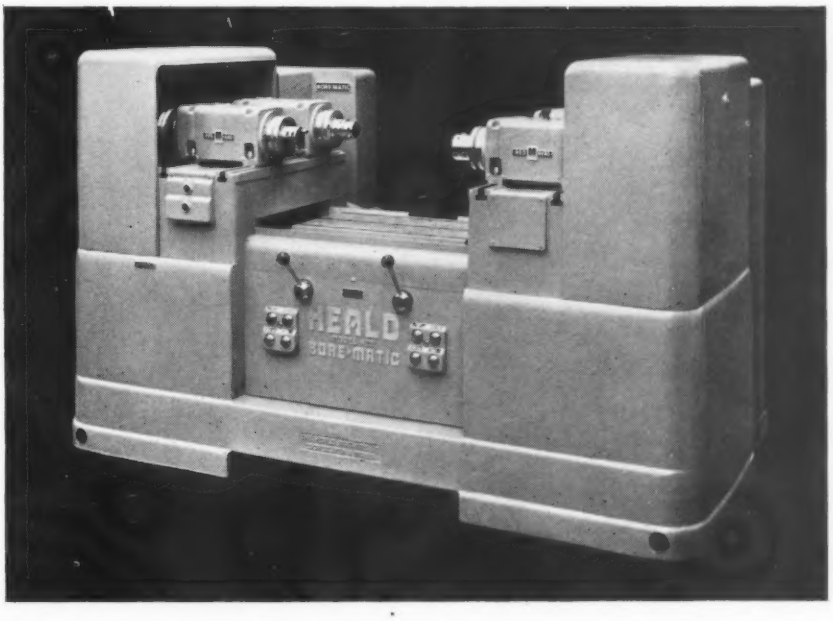


Fig. 2. Double-end Bore-Matic Brought out by the Heald Machine Co.

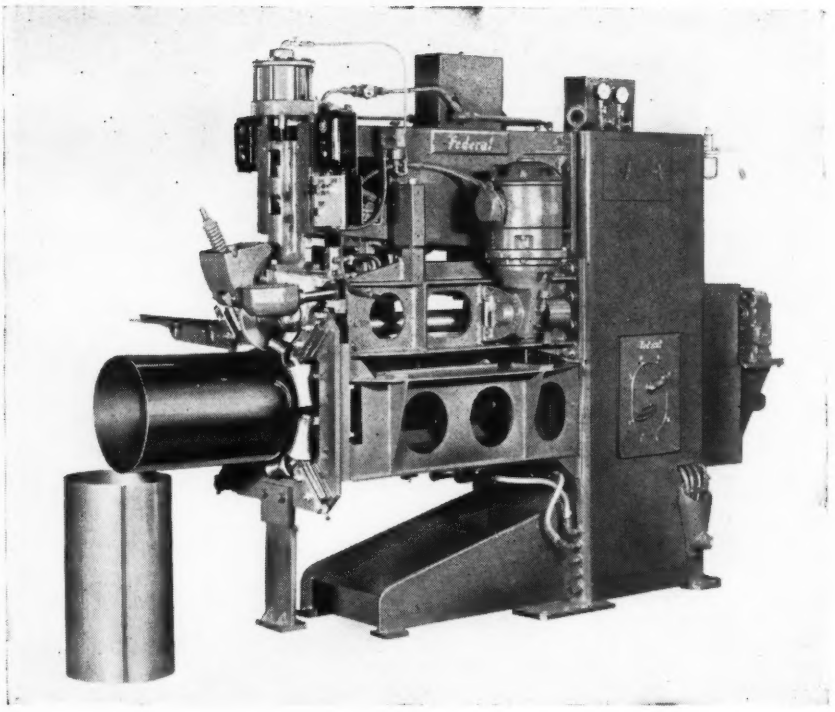
To obtain additional information on equipment described on this page, see lower part of page 234.

Colonial Hydraulic Straightening Press

The line of 15- to 50-ton hydraulic straightening presses built by the Colonial Broach Co., P.O. Box 37, Harper Station, Detroit, Mich., has been expanded by the addition of a 75-ton model. The new machine is designed to handle both finished and rough work. It is equipped with a double-rail straightening fixture to take care of the larger and heavier work for which it is designed. The open-side frame is of reinforced welded steel construction. The ram is actuated by a high-capacity hydraulic cylinder mounted in the head.

Work supports can be of either the center or roller type, depending on the nature of the work to be handled. Extra long guide rails are provided to prevent sagging of long work.

Standard equipment includes hand controls and pressure gage. Foot-pedal operation is also available as special equipment. The press requires a floor space of 54 by 140 inches, including the straightening fixture. The ram has a 12-inch stroke, a power stroke speed of 45 inches per minute, and a return speed of 90 inches per minute. The hydraulic system is operated through a 15-H.P., 1800-R.P.M. motor. 66

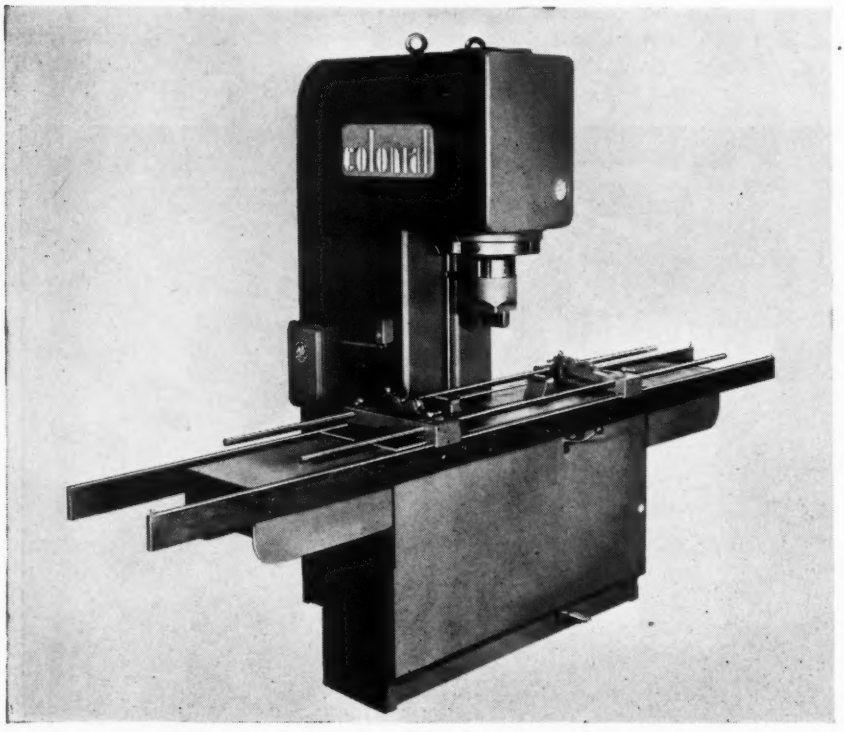


Automatic Cylinder-forming Seam-welder Brought out by Federal Machine & Welder Co.

Automatic Cylinder-Forming Seam-Welder

Flat steel sheets fed into an automatic cylinder-forming seam-welder recently brought out by the Federal Machine & Welder Co., Warren, Ohio, are ejected as welded cylinders at a high rate of production. This new type machine can be equipped to produce 26- to 16-gage mild-steel cylinders ranging from 11 1/4 inches in diameter by 14 inches long to 22 inches in diameter by 37 1/2 inches long at production rates of 600 to 1500 per hour, depending on the length of the cylinders and the thickness of the material.

The sheet stock is manually or automatically fed into the forming rolls of the welder and the formed pieces are automatically welded, after which they are ejected onto a conveyor or mechanical handling system. An abrasive-blast sheet-edge cleaner is designed to become a unit of this machine when processing cylinders from hot-rolled or rusty steel. 67



Colonial Double-rail Straightening Press

Ni-Rod Welding Electrodes

Ni-Rod welding electrodes, suitable for making machinable welds in cast iron, joining cast iron and steel, salvaging defective new castings, and a variety of other purposes, are now being offered to industry in diameters of 1/8, 5/32, and 3/16 inch by the International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. These elec-

To obtain additional information on equipment described on this page, see lower part of page 234.

Millholland Vertical Automatic Indexing Machine

trodes can be operated with either direct- or alternating-current equipment; when used on direct current, reverse polarity is recommended. 68

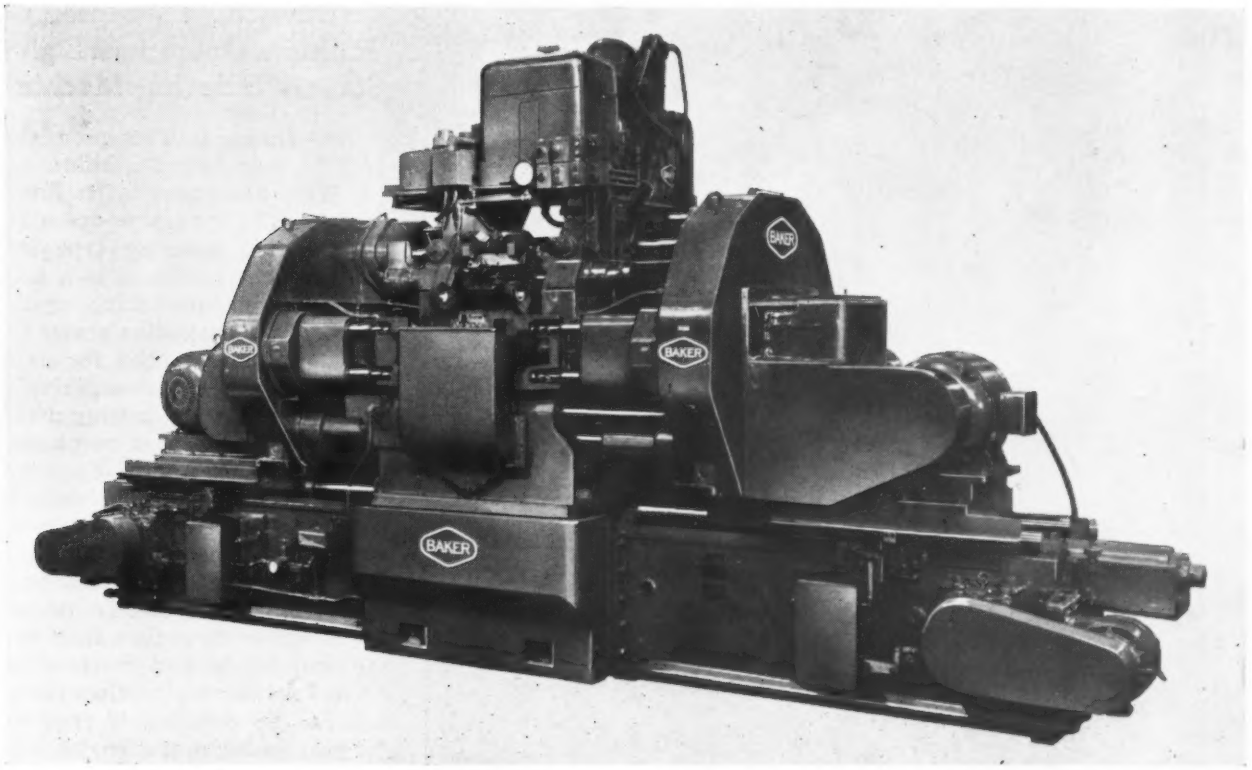
Millholland Automatic Indexing Machine for Drilling, Counterboring, Reaming, and Milling Operations

The W. K. Millholland Machinery Co., 1048 Fairfield Ave., Indianapolis 5, Ind., has brought out an automatic indexing machine designed to perform such operations as drilling, counterboring, reaming, and milling at high production rates. The machine shown is equipped with an automatic cam-feed unit driven by a 5-H.P. motor. The fifteen-spindle head has a bushing plate arranged to register correctly with the fixture at each indexing movement. The machine column and base are constructed of heavy welded steel plate.

Although a six-station index table is shown, the machine can be furnished with three-, four-, eight-, and twelve-station tables. The machine is arranged either for an automatic continuous cycle or for intermittent operation with push-button control. One piece is completed at each indexing movement, the operator simply loading and unloading the work at the first station. The production rate is 500 pieces per hour. In the operation illustrated, three holes are drilled at the second station; three holes reamed at the third station; three holes bored at the fourth station; three holes drilled at the fifth station; and three holes flat-bottomed at the sixth station. 69

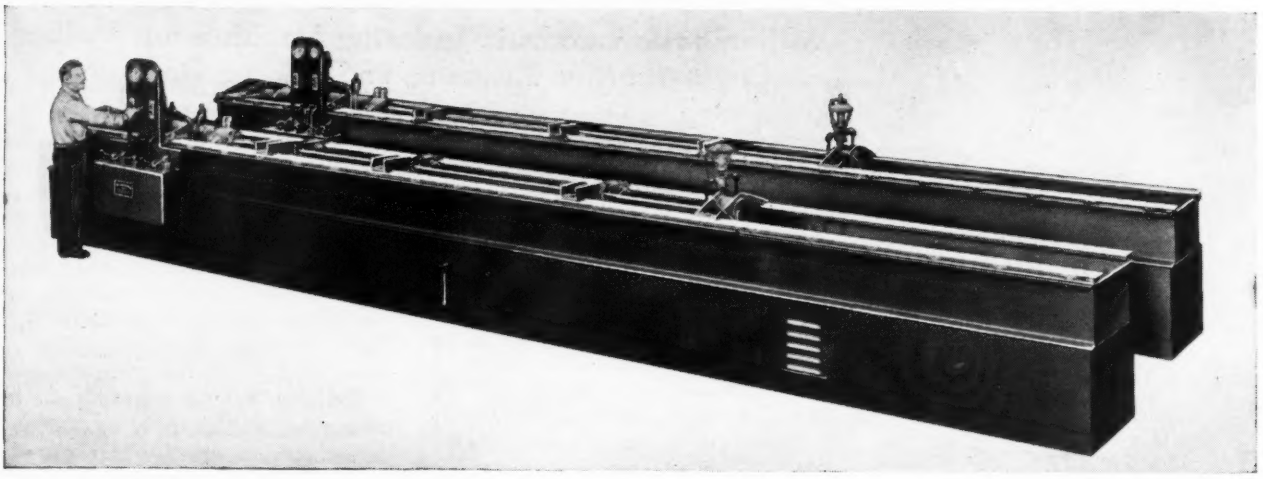
Baker Multi-Operation Machine

Drilling, boring, reaming, counterboring, and tapping operations on automobile front-wheel spindle supports are performed on a new six-station machine manufactured by Baker Brothers, Inc., Toledo, Ohio. This machine is equipped with an automatic power indexing trunnion for transferring the parts from the loading station through the five machining stations. Location at each of the indexing stations is provided first by a shot pin, followed by positive positioning by guide bars that move in with the right and left head units. Clamping and unclamping of one right- and one left-hand part at each station are accomplished through the use of a separate hydraulically operated clamping unit. 70



Multi-operation Machine Manufactured by Baker Brothers, Inc., for Machining Spindle Supports for Front Wheels of Automobiles

To obtain additional information on equipment described on this page, see lower part of page 234.

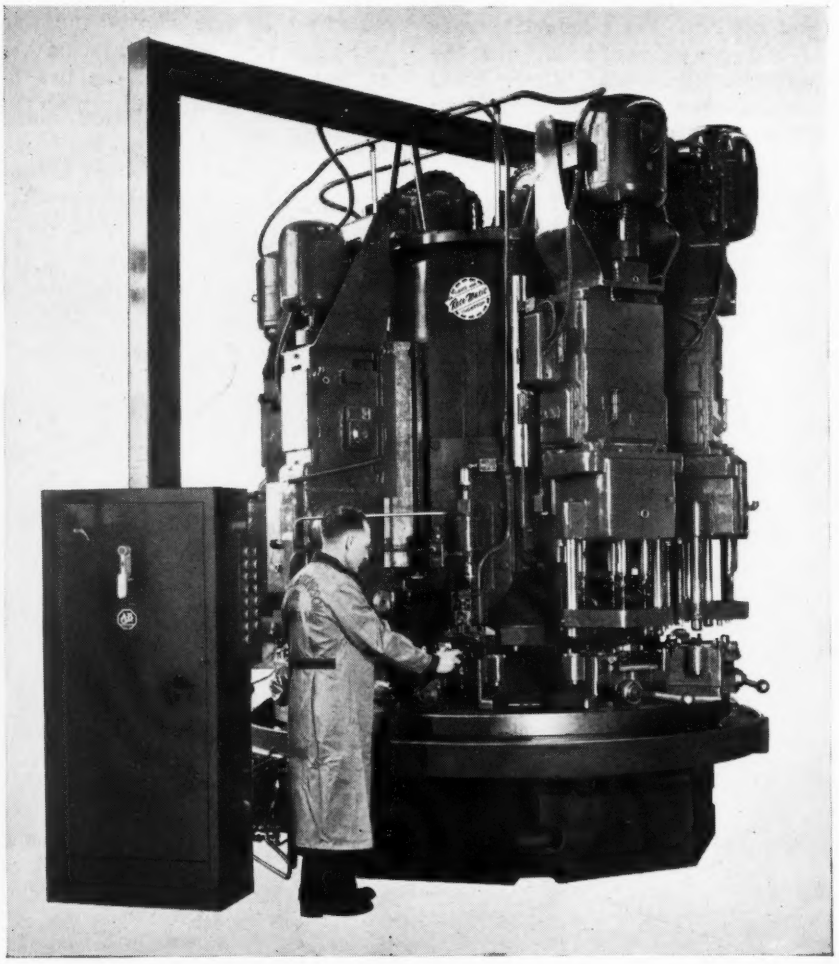


Hydrostatic Type Tube Testing Machine Built by the R. D. Wood Co.

Hydrostatic Tube Tester

The R. D. Wood Co., Public Ledger Bldg., Philadelphia 5,. Pa., recently announced the completion of a new hydrostatic tube tester designed to test tubes with nominal outside diameters from 3/4 inch to 3 1/2 inches and lengths of from 10 to 26 feet at selected and preset pressures from 750 to 3000 pounds per square inch. Average tubes 3 1/2 inches in diameter and 26 feet in length can be tested in forty-five seconds or at the rate of eighty an hour.

In the testing cycle, the tube is first clamped by the air-operated clamping carriages. The head then moves forward and the tube is forced into the sealing assembly in the movable head. Continued motion forces the tube back until it is sealed in the resistance post assembly. The test pressure is then applied. When the test is completed, the cycle is reversed and the tube is ejected by the clamping carriages. The entire operation can be controlled by one man from a panel which contains indicators and two four-way operating valves. 71



Multiple-operation Eight-station Indexing Type Machine Built by the Davis & Thompson Co.

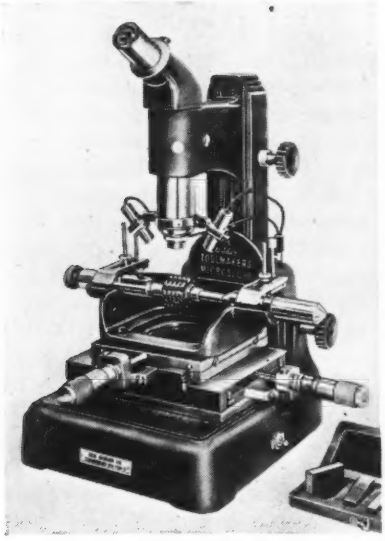
Davis & Thompson Multiple-Operation Eight-Station Indexing Machine

The Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis., has added to its line a Model VSI multiple-operation eight-station indexing type machine which is adapted to a wide range of metal-working operations. The illustration shows the new machine equipped for drilling, reaming, and chamfering a 1.281-inch hole and sawing a slot in each end of front suspension spindle support arms.

The table of this machine is 88 inches in diameter, and the work circle is 80 inches in diameter. The work-table is mounted on a ball-bearing race, and is indexed hydraulically through a fluid motor and worm and worm-wheel drive. A table higher than standard can be provided if required for performing operations on both ends of long work, such as flanged automobile axles.

The drill heads are individually

To obtain additional information on equipment described on this page, see lower part of page 234.



Toolmaker's Microscope Placed on Market by George Scherr Co.

counterbalanced units, hydraulically operated for rapid advance, feed, and rapid return. An auxiliary coolant system can be added when needed. The design of the column is such that the number of stations required for a specific job can be readily provided. An electrical system provides complete operator control for both manual or automatic cycling.

The machine is approximately 9 feet in diameter by 15 feet high and weighs 63,000 pounds. Production of front suspension spindle support arms made of S A E 5135 steel is at the rate of 180 pieces per hour when operating at 80 per cent efficiency. 72

Wilder Toolmaker's Microscope

The George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., is placing on the market the Wilder toolmaker's microscope illustrated, in response to the demand for a low-priced instrument of this type. The microscope provides a standard magnification of 30x, and the standard reticule in the eye-piece contains a 90-degree hair-line cross and a 60-degree cross for thread measurements. To facilitate thread checking, the vertical post, with the microscope and bracket, can be tilted to the helix angle of the thread. The work is either laid on the compound measuring stage or held in a center cradle attached to it.

Measurements in two directions are by heavy type micrometer screws that read directly to 0.0005 inch. For extreme accuracy, gage-blocks can be used with the stage instead of the micrometer screws. A total longitudinal range of 2 inches is provided. Both understage illumination for shadow images and surface illumination for reflected images are provided so that any part, regardless of shape, can be handled. In either case, the image is produced on a clear glass reticule. 73

Wales Sheet-Metal Fabricator

The Wales-Strippit Corporation, North Tonawanda, N. Y., has developed a new machine for rapidly and accurately performing a wide range of sheet-metal fabricating operations, including punching, notching, nibbling, bending, forming, and blanking. The Wales self-contained punch press units form the nucleus of the new machine.

A patented holder accommodates punches and dies of various shapes and sizes, which are instantly interchangeable. Complete sets of quick-change graduated punch assemblies and dies are held on two convenient revolvable storage spindles. With this tool equipment, the machine can be set up quickly for punching holes of different sizes up to 1/2 inch in diameter in mild steel sheets 1/8 inch thick. Three sets of dies with different clearances are provided for each size punch held on the storage spindles. Thus a die with the clearance required to eliminate burrs is instantly available for each size of punch when used in punching material of any thickness up to 1/8 or 3/16 inch.

Sheet-metal pieces of almost

Sheet-metal Fabricator Brought out by the Wales-Strippit Corporation

To obtain additional information on equipment described on this page, see lower part of page 234.

any shape can be cut out around guide plates by setting the "nibble" control lever for continuous operation of the ram. A special adjustable holder is available for use in cutting out circular, semicircular, and arc-shaped pieces.

An outstanding feature of the machine is the "Hydra-New-Matic" head, which operates with a minimum of vibration and noise at 165 strokes per minute for single-hole punching and for nibbling. A full-floating drive-shaft places the ram load directly on the machine frame, eliminates bending stresses on the drive-shaft, and allows the flywheel to run on the frame bearing without imposing any of its weight on the drive-shaft. An adjustable foot-operated trip-control, for use when both the operator's hands are required to feed the work or when large sheets make it awkward to use the hand trip-lever, can be placed at any convenient point within 4 feet from the cord outlet in the machine base. 74

Large Vertical Hydraulic Broaching Machine

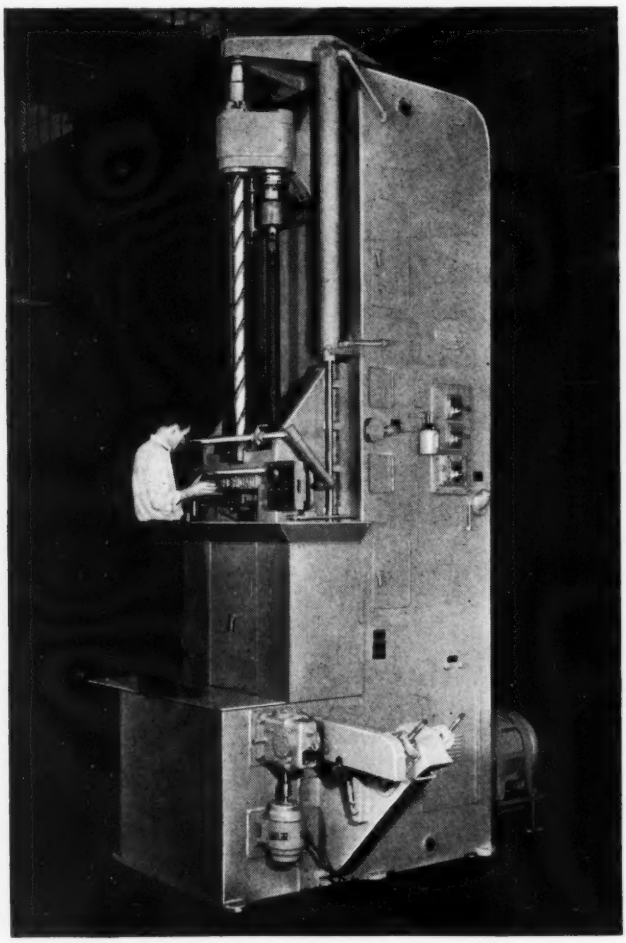
The American Broach & Machine Co., Ann Arbor, Mich., has announced the completion of a large vertical pull-up internal hydraulic broaching machine. This new machine has a height of 16 feet 10 inches and a weight of over 17 tons. The normal operating capacity is 30 tons, and the length of the stroke is 60 inches.

The machine is designed to broach involute splines in gear blanks at more than double the production rate obtained by conventional methods. One of the outstanding features of the machine is the helix lead and nut bar used to drive the broaches during the pulling stroke.

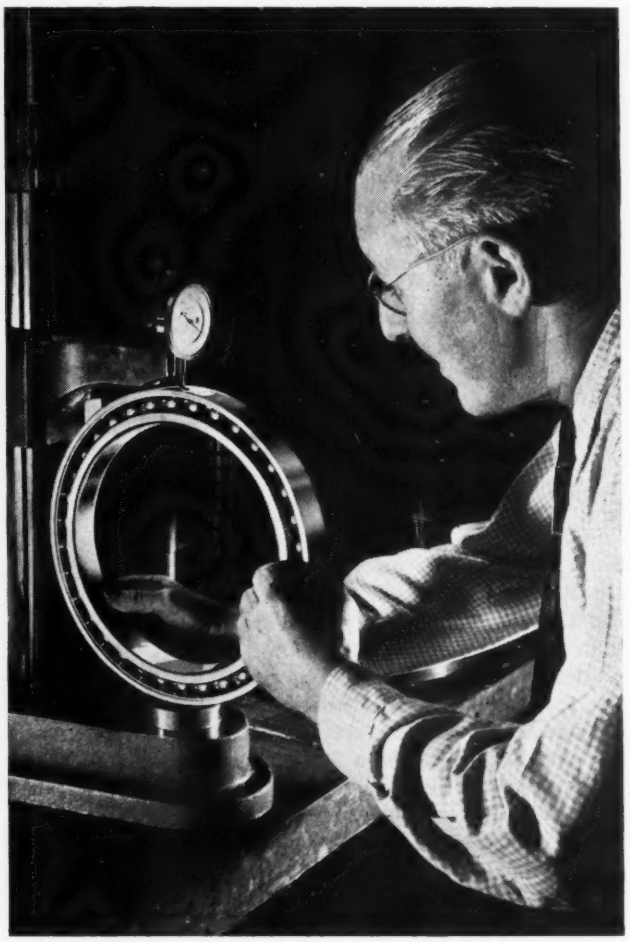
The machine is operated by push-button controls, and all operating cycles are electrically interlocked. One complete cycle produces two parts. In operation, two parts are first loaded into a slide, which is then pushed into position, and buttons are depressed to start the machine cycle. The broaches are raised by the lower guide until the shank ends come up through the parts and are connected to the automatic broach pull-heads. The main machine ram then starts the broaching stroke and the lower guide continues up, providing alignment for the principal portion of the cutting action. When the broaches reach the top portion of the cycle, the operator unloads the parts and then starts the main slide down, returning the broaches to the lower guide. A chip conveyor removes excess chips. Normally the machine is installed in a pit with the operator's platform at floor level.....75

Federal Ball Bearings

Saving in space and weight without sacrifice of load-carrying strength is an outstanding feature of the new XLS series of ball bearings manufactured by the



Hydraulic Internal Broaching Machine Built by the American Broach & Machine Co.



Gaging Outside Diameter of an XLS Series Ball Bearing Made by Federal Bearings Co.

To obtain additional information on equipment described on this page, see lower part of page 234.

Federal Bearings Co., Inc., Poughkeepsie, N. Y. These light, compact bearings have uninterrupted deep groove races, and are capable of taking substantial thrust loads in either direction, as well as heavy radial loads. They are produced in sizes having bores from 1 3/8 to 10 inches, with outside diameters ranging from 2 9/16 to 13 1/4 inches.

These bearings are especially adapted for use in compact clutches; thin-walled housings; large-diameter shafts where the load is such that extremely high carrying capacity is not required; instruments; in fact, wherever the space available for bearing installation is limited and where weight saving is of prime importance. 76

Simplex Special Nine-Unit Automatic Machine for Drilling and Reaming Refrigerator Parts

A special nine-unit machine for simultaneously drilling and reaming holes in refrigerator parts has been developed by the Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1, Mich. This machine is of the fully automatic dial-feed type, using lever-operated pump jigs to hold the part while drilling, reaming, and counterboring.

Electrical interlocking control of the automatic movements insures safe operation. The starting control, which is located within easy reach of the operator, also includes a master stop button. The control system is designed to operate on 110-volt pilot circuit.

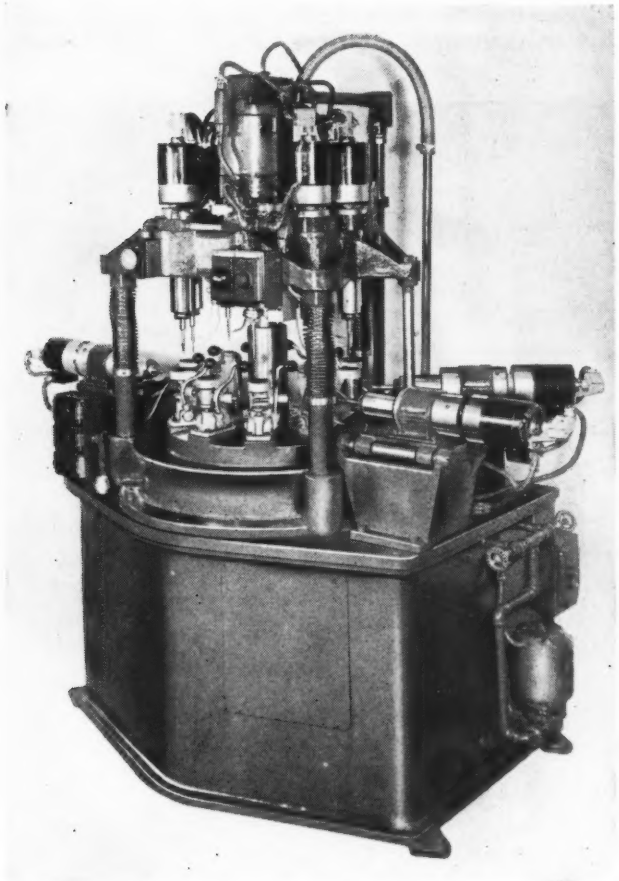
The illustration shows six of the nine automatic drilling units mounted on an adapter plate which is raised and lowered automatically by air cylinders to provide ample clearance from the drill jig bushings. A compact design of pump, shown at the lower right, handles coolant from a built-in tank. The drill units are built in progressive sizes, with drill capacities ranging from No. 50 to 5/16 inch in diameter.....77

Diamond Back-Geared Punch Presses

Two back-geared punch presses, one of 56-ton capacity (Fig. 1) and the other of 14-ton capacity (Fig. 2), have been added to the line of the Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif. The new 56-ton press is equipped with back-gearing to provide for a slower stroke speed and a heavier punching capacity. The frame is mounted in a cradle, and can be inclined any desired amount up to an angle of 35 degrees.

The ratchet-feed arrangement of this press is operated on thrust ball bearings by means of a square-threaded screw. The new non-repeat trip mechanism applied to this press is simple, yet positive, in action. The press has a shut die height of 16 inches; standard stroke of 3 inches; maximum stroke (furnished to order) of 8 inches; bed area of 21 by 30 inches; and operating speed of 50 strokes per minute.

The 14-ton open-back inclinable geared press is believed to be one



Special Refrigerator-part Drilling and Reaming Machine Built by Simplex Tool Engineering Co.

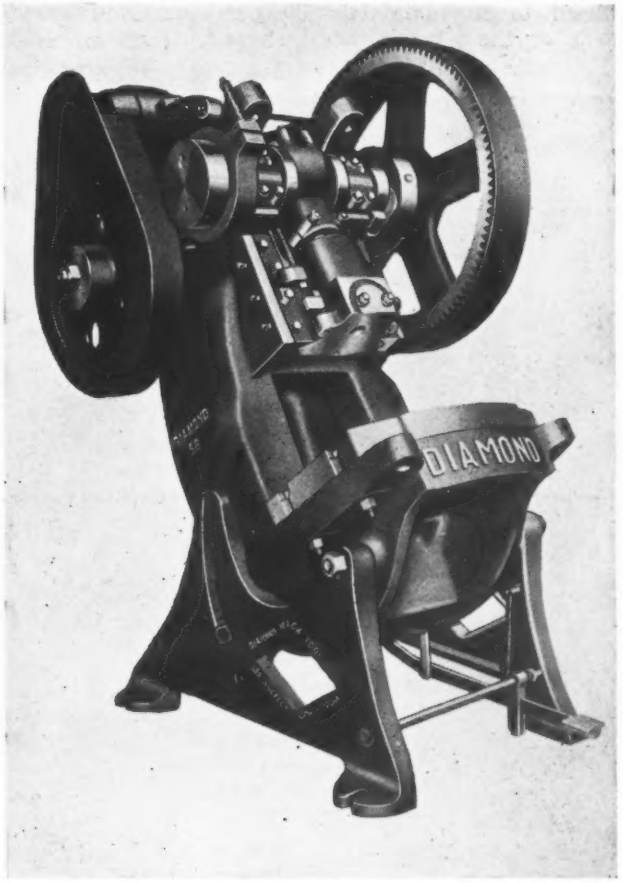


Fig. 1. Back-geared Punch Press of 56-ton Capacity Brought out by the Diamond Machine Tool Co.

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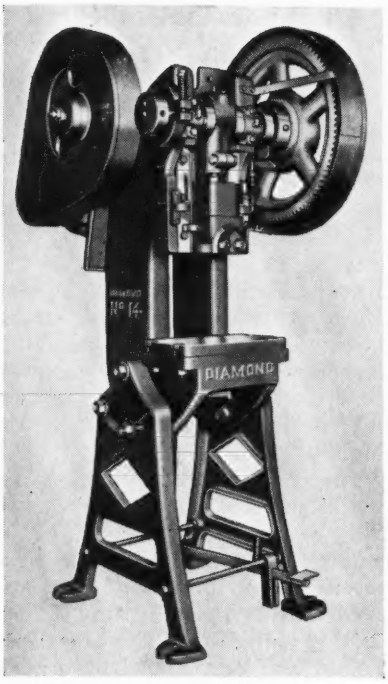


Fig. 2. Diamond Small-size Back-geared Punch Press

of the smallest back-geared punch presses ever manufactured. This press is recommended for use where stroke speed must be reduced to approximately 50 per cent of the normal rate; where delivery of rated tonnage over longer length of ram travel is desired; and where extra long strokes are required.

This press has a maximum speed of 65 strokes per minute; standard stroke length of 2 inches; and maximum stroke length (to order) of 4 inches. The bed area is 8 by 15 inches, and the shut die height 7 inches for the No. 14-A and 9 inches for the 14-B machines. 78

H-P-M Giant-Size Deep-Drawing Press

A huge hydraulic press has been designed and built by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, for use in drawing metal burial caskets. This press has a capacity of 500 tons. It is a completely self-contained unit with H-P-M "Hydro-Power" radial pump and a 100-H.P. electric motor drive. The bed is fitted with a hydraulically actuated die cushion for gripping the metal during the drawing operation.

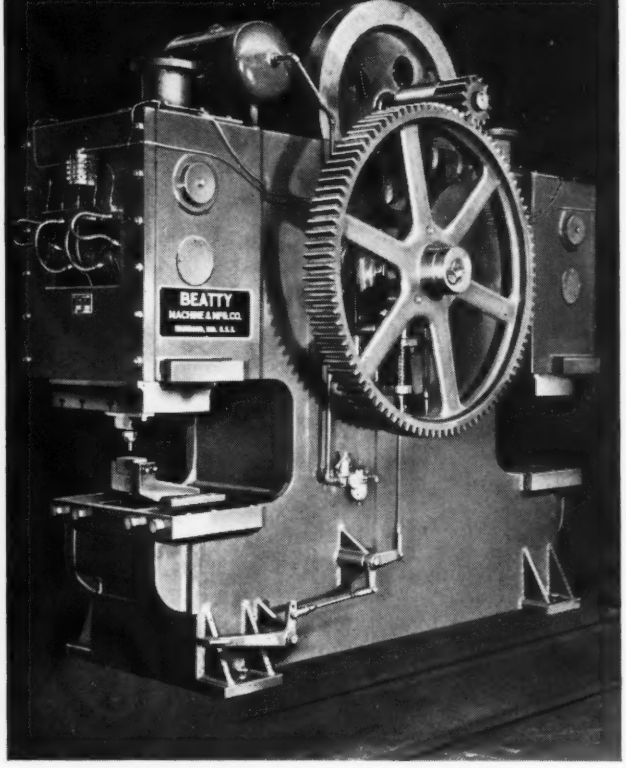
The pressing surface of this machine is 120 by 60 inches. The maximum daylight opening between the slide and the bolster plate is 60 inches, and the maximum ram travel is 42 inches. Die cushion pressure up to 200 tons is available. This type and size of press is adapted for deep-drawing parts of large dimensions in many diversified industries, and is being used extensively where high production, combined with minimum scrap, is a major requirement. ..79

Beatty Double-End Punch

The Beatty Machine & Mfg. Co., Hammond, Ind., has incorporated an entirely new principle of design in its new No. 9 double-end punch. The distance between punching centers has been reduced from 12 feet to 9 feet in the new punch. The throat depth is 24 inches at each end. Welded steel instead of the former cast construction is employed for the new machine.

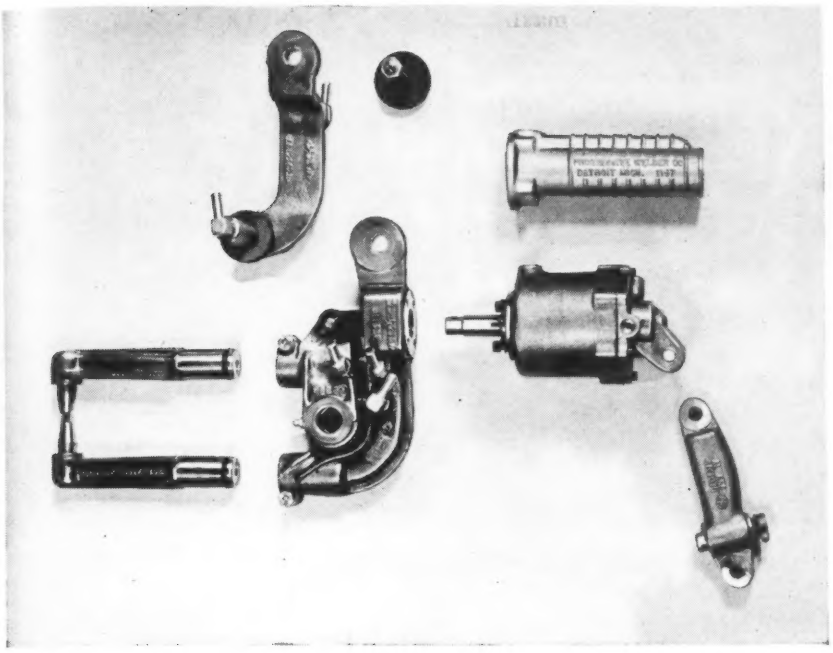
The shortened machine is more rigid, occupies less floor space, and can be more easily fitted into the production line. Other features include centralized lubrication and an air-counterbalanced ram. A front filler block serves to convert the machine for plain table use. 80

Giant-size Deep-drawing Press Built by the Hydraulic Press Mfg. Co.



Double-end Punch Placed on Market by Beatty Machine & Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 234.



Disassembled Interchangeable Parts of Welding Gun Developed by the Progressive Welder Co.

Welding Guns with Standardized Interchangeable Parts

A line of standardized spot-welding guns constructed from interchangeable standardized parts has been announced by the Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich. This new development in standardization is said to enable seven basic gun types designed for heavy and standard duty to take care of 95 per cent of all gun welding requirements. Welding guns constructed from these interchangeable parts can be quickly converted for different jobs by simply changing one or two parts. The parts from which these guns are assembled are designed to produce welding guns that can be handled with maximum ease.

With the standardized parts, it is possible to obtain as many as 57,600 variations with a single basic welding gun chassis, only the jaw extensions and electrodes being varied. In addition to eliminating the cost and time required in designing special welding guns, the new standardized line insures quicker delivery and reduces the number of parts carried in stock.

The illustration shows the disassembled parts of a typical welding gun which can be interchanged to vary the gun design for different applications. The gun chassis is shown in the central view, while at the left are shown the jaw extensions available with various standardized angles of electrode ends and in lengths from 1 to 6 inches. At the top are shown solid interchangeable cable jumpers, and at the right interchangeable air and hydraulic cylinders. 81

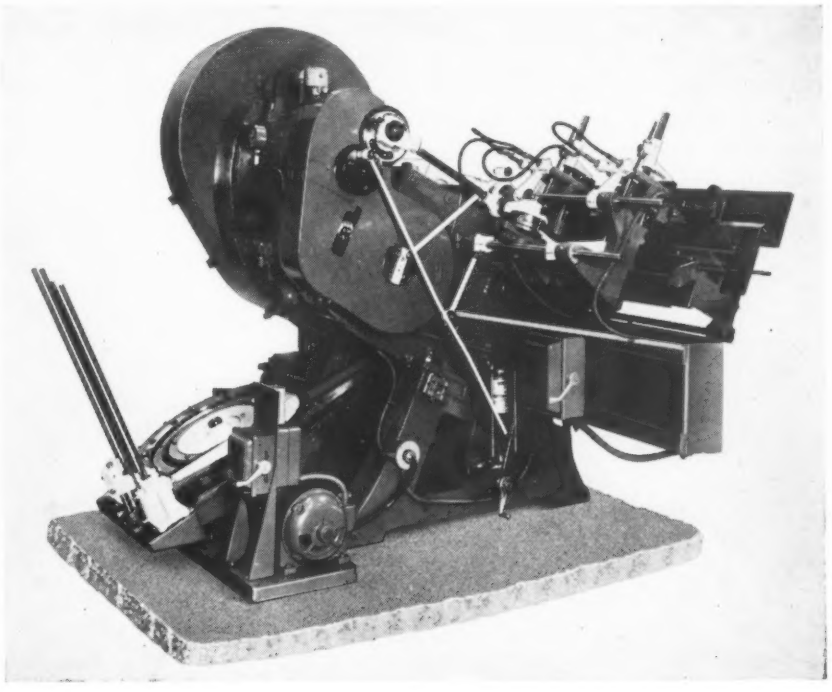
"Ray-Man" V-Belt

The Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., has announced the addition of a newly developed "Ray-Man" V-belt to its line of industrial rubber products. This V-belt has been designed to resist the detrimental action of oil, heat, and static and to meet the requirements for a tough, rugged driving belt. 82

Hamilton-Kruse Automatic Strip-Feed Press

The Lima-Hamilton Corporation, 60 E. 42nd St., New York 17, N. Y., has announced that the Hooven, Owens, Rentschler Co. Division of the company, Hamilton, Ohio, is building a new Hamilton-Kruse automatic strip-feed press designed for medium and high-speed production in the can-making industry. This press is adapted for the use of either single or double dies or for multiple die work with special slides. It has a capacity of 25 tons, and has operated successfully at speeds as high as 225 strokes per minute. While developed primarily for the can-making industry, the new press is applicable to other classes of work.

The slide has a minimum stroke



Automatic Strip-feed Press for Can-making Industry Announced by the Lima-Hamilton Corporation

To obtain additional information on equipment described on this page, see lower part of page 234.

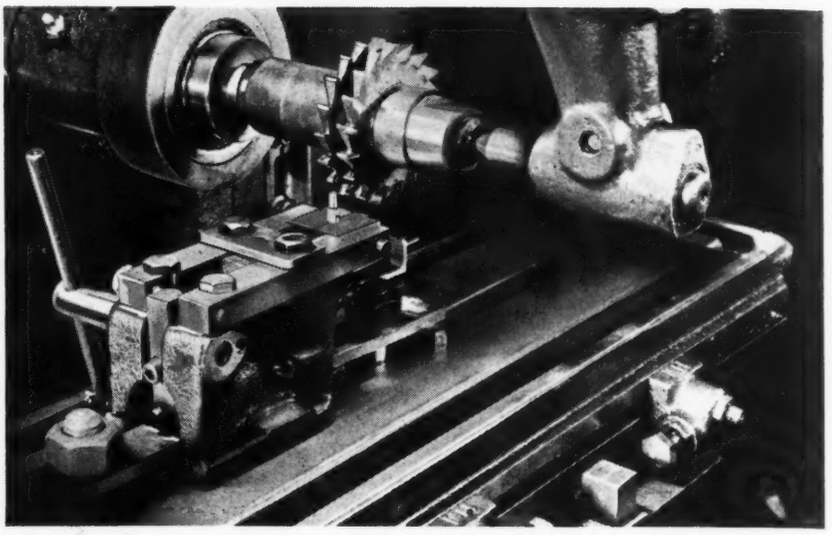
of 2 1/2 inches and a maximum stroke of 5 inches. The press is equipped with a 5-H.P. motor; requires a floor space of 73 by 94 inches; is 77 inches high; and weighs about 8300 pounds. 83

Oster Portable Pipe and Bolt Threading Machine

The Oster Mfg. Co., 2085 E. 61st St., Cleveland 3, Ohio, has brought out an electrically driven pipe and bolt threader having a standard capacity range for handling pipe sizes from 1/4 inch to 2 inches. This machine, designated the "Tom Thumb No. 582," can be furnished to handle 1/8-inch pipe, and with a special drive-shaft will take 2 1/2- to 8-inch pipe. The bolt range is from 1/4 inch to 1 1/2 inches.

A new chuck known as the "Spinfast" eliminates the need for a chuck wrench. The die-head is of the quick-opening, adjustable floating type, with the top open to permit the thread to be seen as it is being cut. The cut-off device is of the quick-cutting roller type. Reaming is accomplished with a device integral with the die-head.

The carriage has a new type lever feed. A thread-length gage giving direct readings facilitates cutting duplicate threads of standard length. The universal, variable-speed, reversible motor operates on either single-phase 110-volt alternating current or direct current. 84



Universal Work-holding Fixture Introduced by Mueller Industries

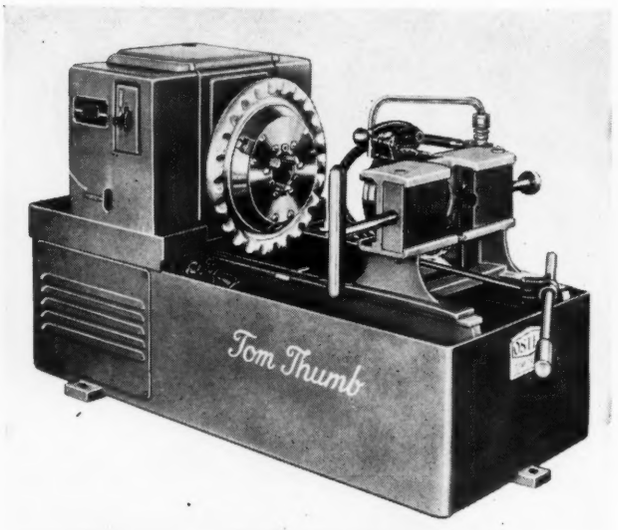
Universal Milling and Drilling Fixture with Self-Centering Device

A universal milling and drilling fixture of the self-centering type, designed for rapid production, has just been announced by Mueller Industries, Department 50, 4755 N. Rockwell St., Chicago 25, Ill. This fixture can be used or milling, drilling, assembling, threading, counterboring, and similar operations. It can be operated either manually or automatically by pneumatic or mechanical means.

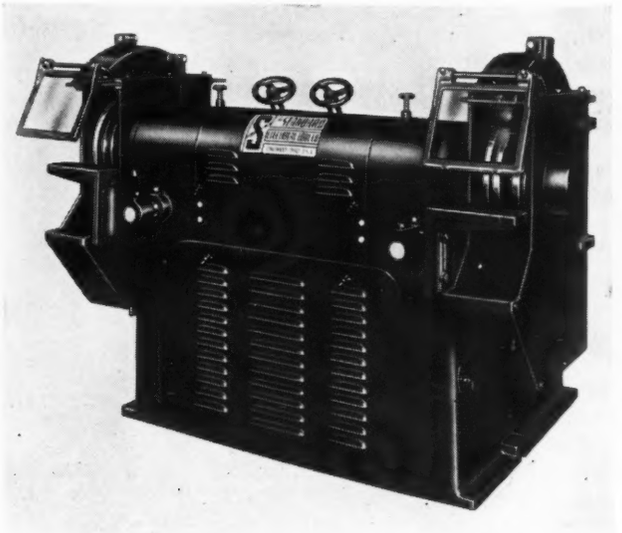
The self-centering unit assures precise locating of work and is completely adjustable for variations in pressure, location, etc. The clamp jaws have a 3/16-inch maximum opening, which will allow a piece to be gripped behind a shoulder. The device will accommodate round or hexagonal work up to 1 inch in size, as well as odd-shaped pieces within this range. 85

Variable-Speed Snagging Grinder

The Standard Electrical Tool Co., 2500 River Road, Cincinnati 4, Ohio, has completely redesigned its No. 35 "Twin Motor" snagging grinder. This machine, designed for simultaneous use by two oper-



Portable Pipe and Bolt Threading Machine
Brought out by the Oster Mfg. Co.



Improved Variable-speed Snagging Grinder
Built by Standard Electrical Tool Co.

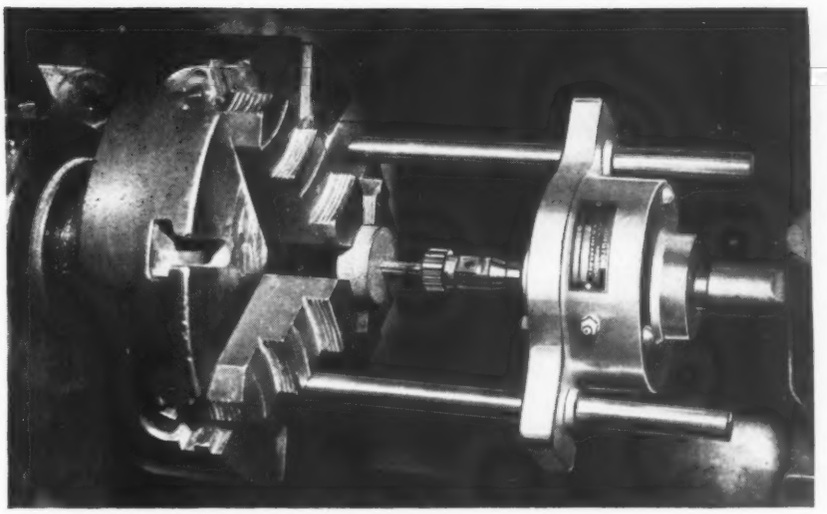
To obtain additional information on equipment described on this page, see lower part of page 234.

ators, now has two independent spindles and two 7 1/2-H.P. motors, as well as duplicate magnetic starters, start-stop push-button stations, shaft locks for use in changing wheels, and infinitely variable speed drives. This equipment permits each operator to handle an entirely different kind of work.

An interlocking arrangement makes it impossible to operate the wheels in excess of the recommended speed. As the individual grinding wheel wears, the guard is adjusted and the speed control handwheel turned to the limit stop that indicates the correct spindle speed for the diameter of the worn wheel. Ball bearings are protected in large-size oil reservoirs with labyrinth seals and sight-feed oil gages. The 4- by 9-inch work-rests are adjustable and removable. 86

R and L Knurling Tool

A new streamline knurling tool of exceptionally light weight, designed to afford a better grip on the tool and more accurate control of the knurling rollers, has been brought out by R and L Tools, 1825 Bristol St., Nicetown, Philadelphia 40, Pa. All locking screws of this new tool are positioned on the outside of the tool for accessibility. The lock-screw that holds the pin used to position the knurling tool is considerably longer than the ones ordinarily employed and will not work loose. This knurling tool is available in various sizes. 87



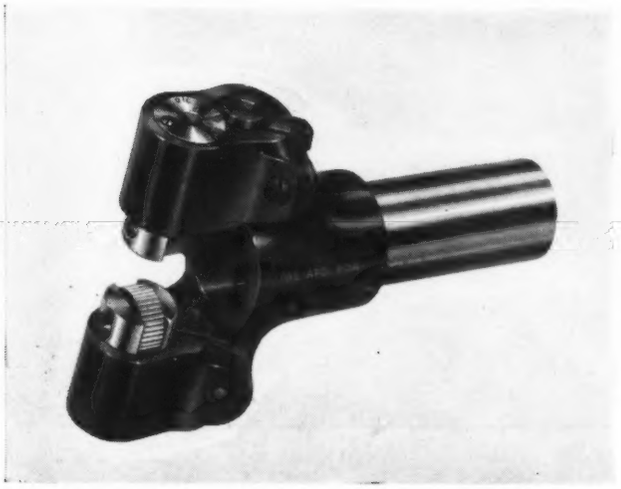
Errington "Auto-Reverse" Tapping Device Applied to Turret Lathe

Errington "Auto-Reverse" Tapping Device for Turret Lathe

A new "Auto-Reverse" turret-lathe tapping device by means of which the tap can be backed out of the work without stopping the rotation of the work or reversing the machine has been brought out by Errington Mechanical Laboratory, Inc., Staten Island 4, N. Y. Tapping is accomplished with this device by simply feeding the tap into and out of the drilled hole while the work is rotated in one direction. By using a friction chuck, blind holes can also be tapped without danger of breaking the tool. This device can be employed on a drill press for production tapping by using guide bars to hold the case. 88

Small-Size Portable Air Compressors

Two portable fractional-horsepower air compressors designed to eliminate all contact or contamination of the air with lubricating oil have been brought out by the Kellogg Division, American Brake Shoe Co., 230 Park Ave., New York 17, N. Y. The Model 17-C compressor, shown in the accompanying illustration, delivers 4.4 cubic feet per minute of free air at 40 pounds per square inch pressure. It is equipped with a 1/2-H.P. electric motor, and has "lubricated for life" sealed ball bearings. The Model 8-C compressor is provided with a 1/4-H.P. motor, and will deliver 2.2 cubic feet per minute of free air at a pressure of 25 pounds per square inch. ... 89



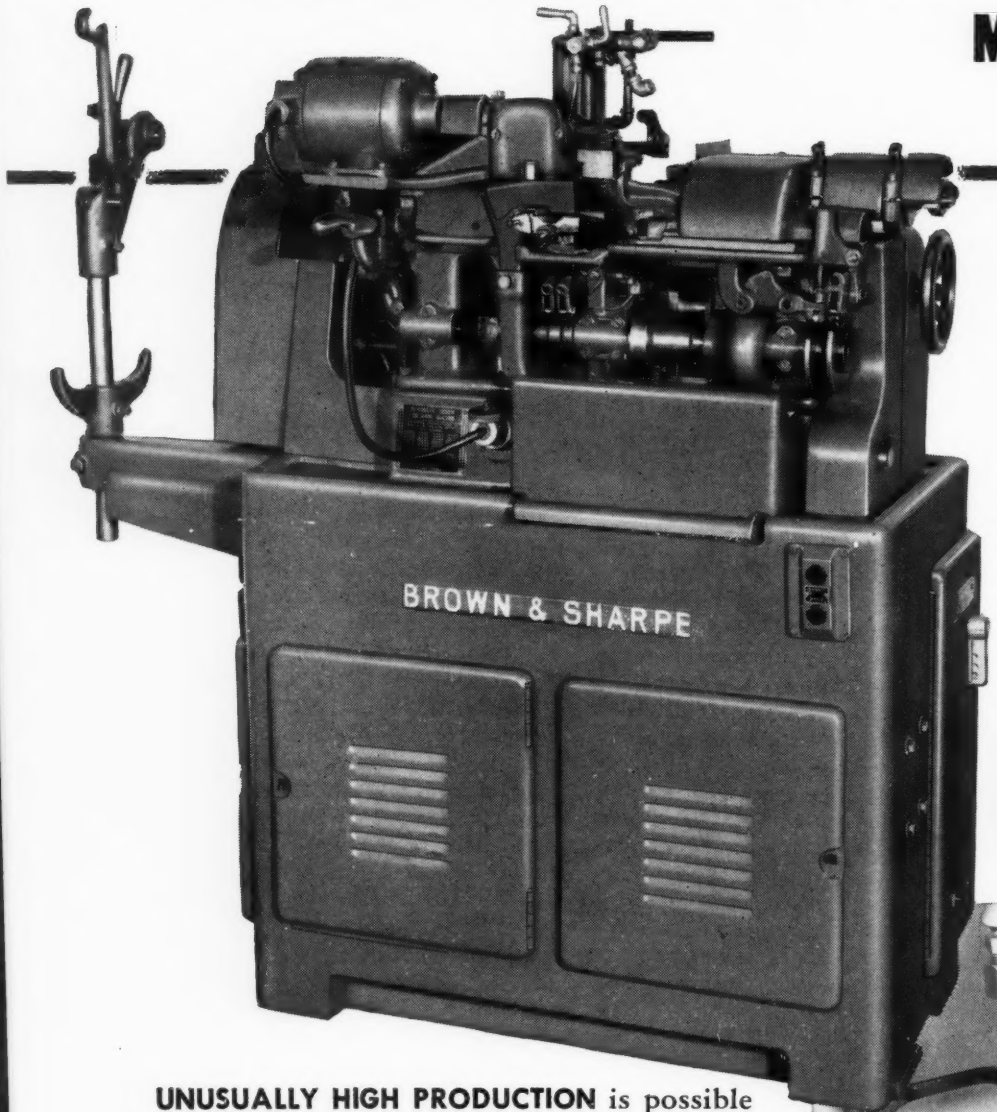
Streamline Knurling Tool Recently Placed on the Market by R and L Tools

Portable Fractional-horsepower Air Compressor Brought out by American Brake Shoe Co.

To obtain additional information on equipment described on this page, see lower part of page 234.

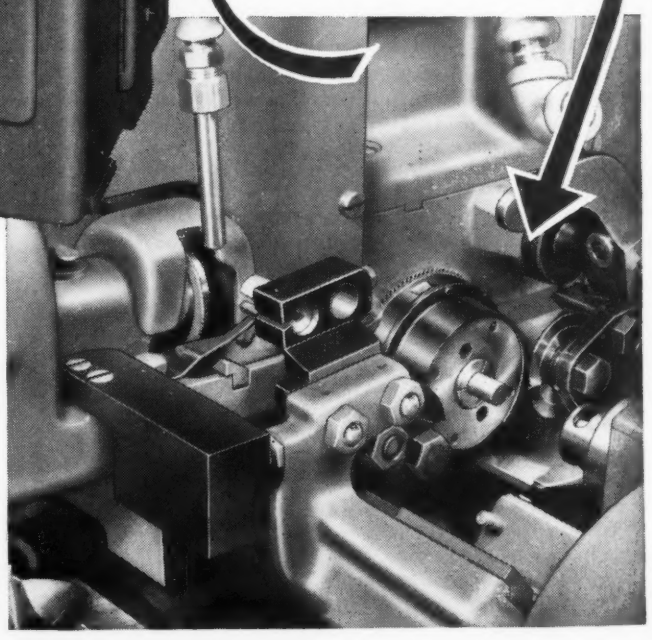
FASTER PRODUCTION...

NEW-DESIGN AUTOMATIC SCREW THREADING MACHINE



Capacity . . . 3/8" hole through largest finger. Threads any length to 1". Greatest distance from front of chuck to face of die, 2 7/8"; least, 1/8".

Speed Range . . . there's a range of die and spindle speeds suitable for any material.



Close-up showing work spindle and threading spindle. Both rotate in same direction at different speeds . . . the *difference* is the effective threading speed. Threading dies are backed off simply by automatic stopping of threading spindle.

UNUSUALLY HIGH PRODUCTION is possible on certain types of work because this machine has been specifically designed to take full advantage of overlapping operations and to reduce idle time to a minimum.

Set-ups and operation are easy, and long life assured because all the latest refinements and improvements in design and construction have been incorporated in this new Brown & Sharpe Machine. Write for complete specifications. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

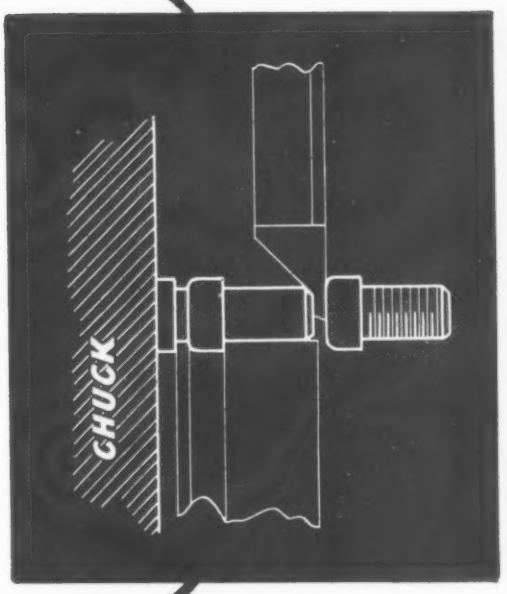
BROWN &

OF SMALL SCREWS, NUTS, BUSHINGS . . .

by OVERLAPPING OPERATIONS

HERE'S HOW! Both the work spindle and the threading spindle of this new-design, automatic screw threading machine rotate in the same direction but at different speeds. The difference in speeds permits the die or tap to cut at the required surface speed for threading while the work rotates at suitable speed for turning or other operations. Diagram at right shows simultaneous tandem production of a screw. Threading and cutting-off (partial) are performed on one piece while initial operations are being performed on succeeding piece.

For the production of bushings, a die spindle is available as a drill spindle.



MANY ATTACHMENTS ADD WIDE VERSATILITY . . ELIMINATE REHANDLING AND USE OF SECOND MACHIN

Automatic Rod Magazine . . . especially valuable, since this machine uses stock so rapidly.

Vertical Slide Attachment . . . makes increased production possible on certain classes of work by leaving both cross slides available.

Longitudinal Turning Attachment . . . permits efficient production of screws with proportions beyond regular forming capacity.

Burring Attachment . . . carries a single tool for chamfering or taking other light cuts on cut-off ends of bushings and similar pieces of work.

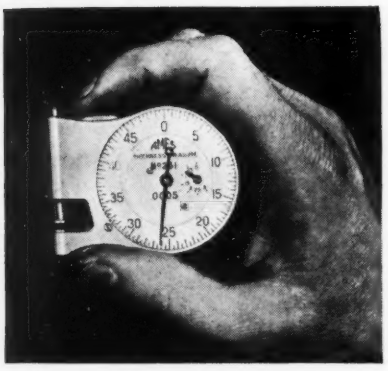
Nut Tapping Attachment . . . provides for efficient production of nuts and similar internally-threaded parts. Permits one nut to be tapped while blank for next nut is being made.

Index Drilling Attachment . . . indexes and drills one piece while the machine is producing another. In some cases entire drilling time is saved.

Other Attachments . . . Silent Stock Support, Slabbing Holder, Attachment Driving Stand.

SHARPE

B·S



Ames Thickness Measuring Gage

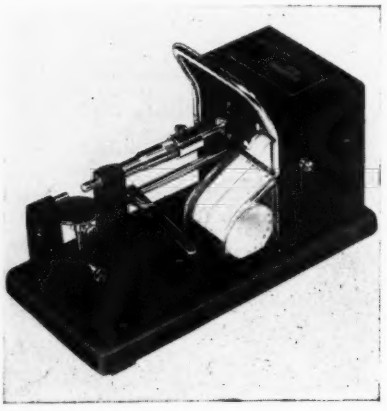
Ames Thickness Measuring Instrument

An improved line of dial thickness measuring instruments, including two 0.0005-inch graduated models, is being placed on the market by the B. C. Ames Co., 27 Ames St., Waltham 54, Mass. Simple zero adjustment and fixed parallel contacts are features of these gages. The new models weigh only 1 1/2 ounces, have a case thickness of 1/4 inch, and can be easily carried in the pocket. They are suitable for measuring both compressible and non-compressible materials, including metal, rubber, felt, cloth, paper, glass, and plastics.

Drawing the index finger back across the knurled wheel serves to raise the upper anvil, so that the piece to be measured can be easily inserted. Simply lifting the finger releases the wheel and allows the uniform spring pressure to close the upper anvil on the work surface. These gages are available in a variety of models with different dial graduations and contacts. 90

Automatic Dimensional Recording Gage

Quality control by a new system is made possible by a recording gage manufactured by the KT Laboratories, Inc., Boston, Mass., and sold exclusively by the Federal Products Corporation, 1144 Eddy St., Providence 1, R. I.



KT Recording Micrometer Inspection Gage

The new gaging equipment measures a part and automatically records the dimension on a continuous tape which is ruled off in increments of thousandths and half-thousandths of an inch.

The position of the recording dot on the tape on either side of the zero or exact-size line indicates whether the part is under or over size. The normal measuring range of the micrometer is from 0 to 1 inch, and it will check within limits of minus 0.003 and plus 0.003 inch. While the chart paper is ruled off to 0.0005 inch, readings can be estimated to 0.0002 inch.

This gage makes possible the rapid, accurate recording of the dimensions of production parts, and automatically provides a permanent record. The chart shows at a glance just how the work dimensions are running and thus warns the operator before parts are produced which will not pass inspection. 91

Rollway Steel Retainer Type Precision Roller Bearings

The Rollway Bearing Co., Inc., Syracuse, N. Y., has announced a precision cylindrical roller bearing, designated the "Tru-Rol," which has a new steel roll retainer, shown in Fig. 1. This bearing complements the Rollway lines of cylindrical roller, radial, and thrust bearings. The distinctive one-piece steel retainer has pockets with deep, broad, double flanges, or guide lips, which keep the rollers in alignment and thus insure long life for the bearings.

The outer race has deep, accurate ring grooves into which the heavy snap-rings are assembled to hold the roller retainer and rollers in the outer race. The inner race

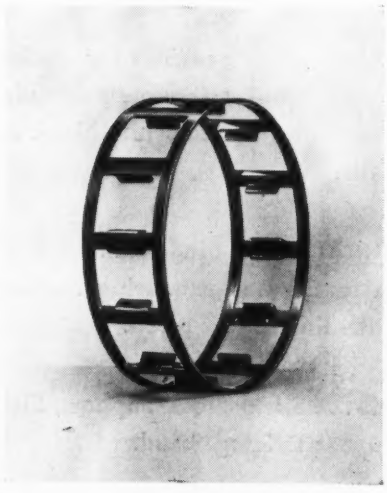


Fig. 1. Steel Cage Type Roller Retainer for "Tru-Rol" Roller Bearings

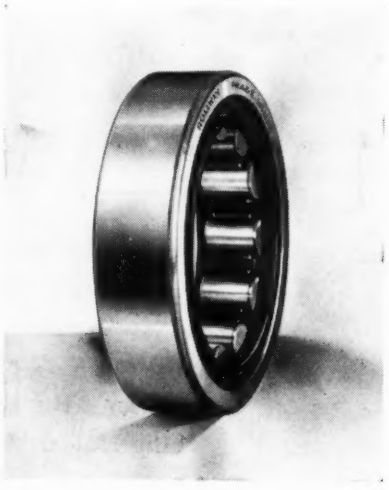


Fig. 2. "Tru-Rol" Bearing without Inner Race for Direct Assembling on Shaft

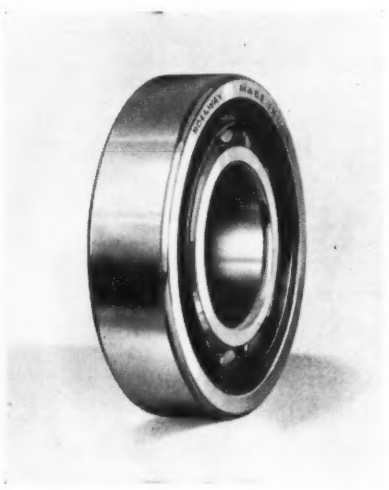


Fig. 3. "Tru-Rol" Bearing with Outer and Inner Races and Snap Rings

To obtain additional information on equipment described on this page, see lower part of page 234.

This ¾-inch shear is cutting plate rapidly and accurately with a sharp reduction in cost over other methods.

The 36 or 48-inch micrometer back gauge is a valuable time saver for cutting plate to size. To accommodate extra long plates, the Cincinnati back angle swings up out of the way.

When it is desirable to shear to a scribed line, the Cincinnati light beam gauge positions the plate rapidly and accurately.

Plates roll easily across Cincinnati tables on ball transfers, cutting handling time and physical effort.

Cincinnati inclined rams present the corner of the knife to the work and shear straight and clean.

Cincinnati features ensure quick handling, accurate work and low shearing costs.

THE CINCINNATI SHAPER CO.

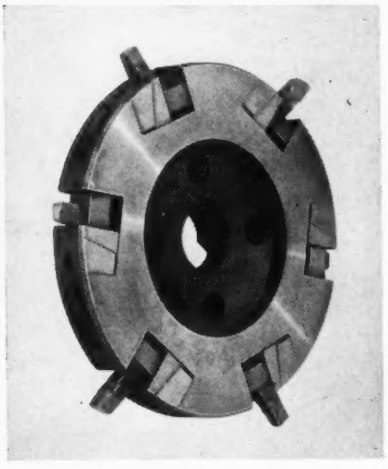
CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

is separate and is interchangeable. Any "Tru-Rol" bearing can be used with or without the inner race, depending on the application. The bearings are made in a wide range of sizes conforming to the S A E standards for roller bearings. 92

"Kendual" Fly Cutter and Face Mill

The Kendall Corporation, 2361 N. 29th St., Milwaukee 10, Wis., has announced a new series of fly cutters and face mills made to fit the conventional arbors and the standard American spindle nose drives of milling machines. These cutters are designed for efficient operation at the constantly increasing speeds of modern milling machines. The hexagonal-shaped tool-bit holders facilitate angular setting of the tool bits and provide positive locking means f o r maintaining the setting.



Fly Cutter Made by the Kendall Corporation

Positive clamping of the tool bit is assured by means of a tapered s p a c e r, a clamping wedge, and a clamp screw which is so located in the cutter body that it receives no shearing s t r e s s. Each tool bit can be ground and individually positioned to do its portion of the cutting.

These cutters can be easily adjusted to suit the requirements of either long- or short-run jobs or jobs which would otherwise require the purchase of special milling cutters. They can be used for any number of milling operations, such as fly cutting, slotting, surface milling, straddle milling, form milling, and other types of machining that would ordinarily require several sets of cutters. The cutters are made in 6-, 8-, and 10-inch sizes. 93

Carson Electronic Micrometer

The Carson Micrometer Corporation, Little Falls, N. J., has announced a new Model K electronic micrometer for measuring the thickness of fine wire, paper, rubber sheet, paint films, and other thin materials of a hard or soft conducting or non-conducting nature. This instrument will measure materials as thin as 0.0001 inch with an accuracy of twenty millionths of an inch under anvil pressures as light as 1/4 ounce. The accuracy is independent of the operator's skill or sense of touch.

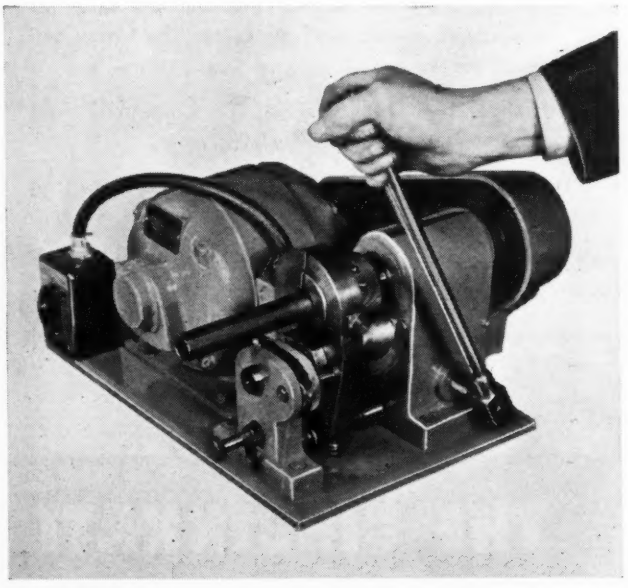
The measuring range of this instrument is 1/8 inch, but the micrometer head can be raised to accommodate work up to 3/8 inch thick. Anvils are of hardened steel, and may be of any diameter from 1/64 to 5/16 inch, with flat or spherical surfaces. Anvil pressure ranges from 1/4 ounce to 1 pound. The anvils are lapped flat and parallel to an accuracy of ten millionths inch. 94

Carson Electronic Micrometer for the Precision Measuring of Thin Materials

Pines Semi-Automatic Tube Deburring Machine

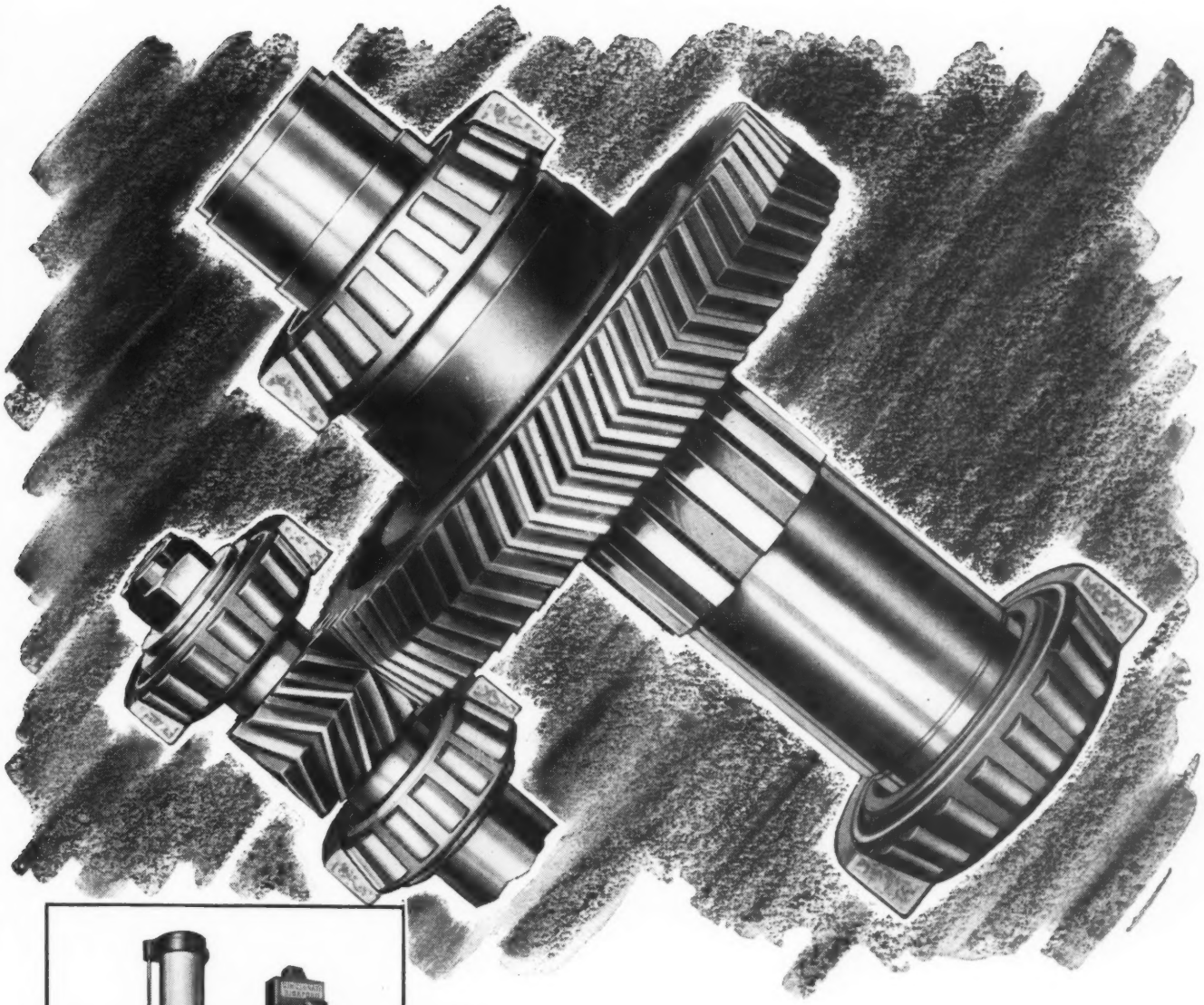
A bench type manually operated semi-automatic machine designed for finishing tube and rod ends at high production rates has been placed on the market by the Pines Engineering Co., Aurora, Ill. This machine will perform such operations as deburring, inside and outside chamfering, facing, center-drilling, flaring, beading, drilling, reaming, and single-point boring.

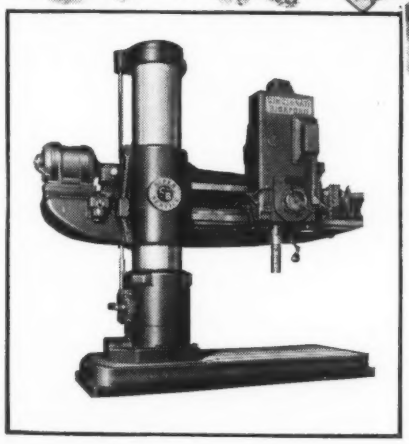
The m a c h i n e is equipped with a new type mechanical chuck and chuck-closing mechanism designed to positively hold tubes, pipes, or rods of any size up to 2 inches in diameter, chuck inserts being available for any size work within this range. The tool-holder is slotted to receive three cutters, and is designed to p e r m i t quick changing of the cutters. Power is furnished by a 1/2-H.P. motor. Production rates range from 500 to 1000 finished ends per hour. The machine weighs about 170 pounds. 95



Semi-automatic Tube and Rod Deburring Machine Manufactured by Pines Engineering Co.

To obtain additional information on equipment described on this page, see lower part of page 234.





On EVERY JOB you do—

The smooth, chatterless, powerful and durable drive of the Cincinnati Bickford Super Service Radial Drill is a success factor in every job you do.

Driven by 10 splines machined from the solid, the driving gear is mounted on a special continuous bronze alloy sleeve which is carried by anti-friction bearings mounted on close centers.

Herringbone, continuous tooth gears are used for the lower speed ranges—for strength and smooth-rolling action.

The large continuous tooth gear never exceeds 500′ peripheral speed a minute, automatically declutches at high speeds and eliminates strains of flywheel inertia on high speeds and on spindle reverse.

Such design and engineering give Cincinnati Bickford Super Service Radial Drills great accuracy and a long life of trouble-free operation.

Write for the detailed bulletin No. R-29 for complete data.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT DRILLING MACHINES

SUPER SERVICE

Radials 7½″ dia. col., 2½′ arm, to 26″ dia. col., 12′ arm.
General purpose Uprights, 21″ to 28″ sizes.
Production Uprights, 21″ to 28″.
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

Webber Angle Inspection Gage-blocks

Webber Angle Gage-Blocks

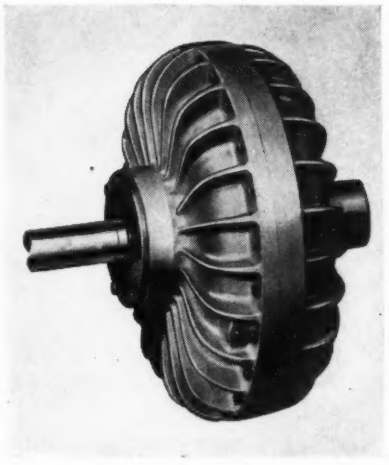
The Webber Gage Co., 12900 Triskett Road, Cleveland 11, Ohio, has brought out a line of gage-blocks designed to measure angles in degrees, minutes, and seconds. These angular gage-blocks can be wrung together to obtain the desired angle. A set of sixteen angle blocks will give 356,400 angles in steps of one second with an accuracy measured in millionth parts of a circle. Actually, the blocks are guaranteed to be accurate within 1/5,184,000 of a circle. 96

"Cone-Drive" Speed Reducer

A new series of speed reducers with 7-inch center distance, in ten standard ratios ranging from 5 to 1 up to 70 to 1, has been added to the line of heavy-duty right-angle reducers built by the Cone-Drive Division, Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. This new series is of intermediate size and is available in three types—with pinion under the gear; with pinion over the gear; and with gear-shaft vertically positioned. All ratios and types are also obtainable with double extended gear- or pinion-shafts.

Mechanical horsepower ratings range from 1.56 at 100 R.P.M. for the 70 to 1 ratio up to 94.2 at 2400 R.P.M. of the pinion for the 5 to 1 ratio. The new 7-inch reducers will carry approximately 50 per cent more power than the models with 6-inch center distance. 97

"Cone-Drive" 7-inch Right-angle Speed Reducer



"Fluidrive" Hydraulic Coupling Made by CraneVeyor Corporation

"Fluidrive" Hydraulic Coupling

A "Fluidrive" hydraulic coupling with cartridge-mounted shaft bearings incorporated in the design is being manufactured by the CraneVeyor Corporation, 1240 S. Boyle Ave., Los Angeles, Calif. The shaft end bearings in the drive coupling have been especially designed to assure permanent shaft alignment.

This new "Fluidrive" is a completely self-contained hydraulic coupling, with simple impeller element and runner unit, mounted on its own integrally fitted ball bearings. Straight radial vanes make possible operation in either direction. Low inertia of impeller and runner facilitates quick stops and reversing duty. The unit is available in two sizes, with capacities of 5 and 7 1/2 H.P. 98

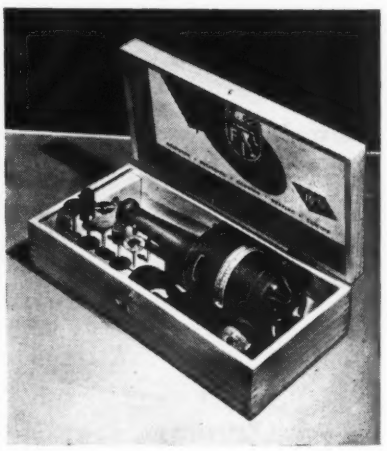
Contact Wheel for Abrasive-belt Polishing

"Beltflex" Contact Wheel for Abrasive-Belt Polishing

A new contact wheel for abrasive-belt polishing has just been announced by Divine Brothers Co., 200 Seward Ave., Utica 1, N. Y. This contact wheel, called "Beltflex," has been designed to eliminate the necessity of using buffing sections under abrasive belts. It has all of the advantages of the buff sections, in addition to controlled balance and density. The wheel has a smoothly ground surface which tends to insure uniform belt tracking. 99

Fairchild Electric Grinder

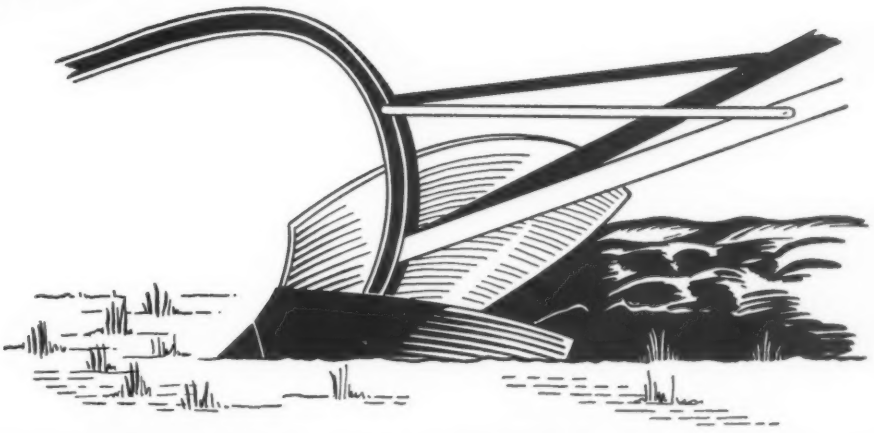
Fairchild Industries, 110 Main St., Burlington, Vt., has brought out a new hand type electric grinder that has sufficient power for many industrial uses, as well as being especially adapted for use in hobby or home work-shops. Balancing and streamlining to fit



Electric Grinder Made by Fairchild Industries

To obtain additional information on equipment described on this page, see lower part of page 234.

A tap is like a plow..



. . . IT'S ALMOST IMPOSSIBLE TO LUBRICATE

THAT'S WHY

DETROIT

TAPS ARE MADE OF M-11 CHROME-COBALT H.S.S.

•

The Home of

"M-11" CHROME-COBALT H.S.S. TAPS, THREAD MILLING CUTTERS & THREAD GAGES

The cutting edges and faces at the tip of the thread on a tap are "buried" in the metal on three sides. It's almost impossible to get lubricant to those points. Furthermore, cutting is continuous.

That makes thread cutting one of the toughest jobs there is in metal cutting, and is a major reason why Detroit taps are made of that toughest of tap steels—M-11 chrome-cobalt H. S. S.

The cobalt gives Detroit taps greater uniformity and higher red hardness.

Chromium gives Detroit taps greater toughness, for less breakage; deeper hardness penetration, corrosion resistance and GREATER RESISTANCE TO ABRASION.

And back of every M-11 tap, thread milling cutter and thread gage is a service record which can make the proud claim:

WE'VE NEVER "SHUT DOWN" A LINE YET!!

DETROIT

TAP & TOOL CO.

8432 BUTLER STREET • DETROIT 11, U. S. A.

the operator's hand, together with vibrationless operation, enable precision grinding work to be performed without fatigue. The grinder is equipped with a 1/20-H.P. Fairchild universal type motor, which is dynamically balanced to insure smooth operation at 20,000 R.P.M. 100

"Spiralcool" Sanding Disk Backing Pad

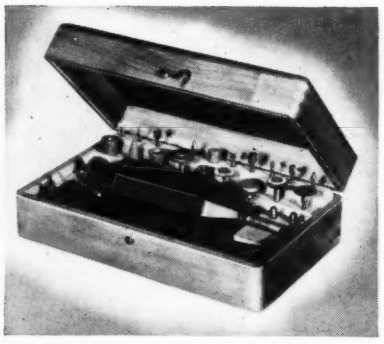
A new "Spiralcool" backing pad for disk sanders is being produced by the Pratt Mfg. Co., Inc., 614 E. Madison St., Fairmount, Ind.

Sanding Disk Backing Pad

The backing pad is made of layers of rubber reinforced with fabric and securely bonded to a slotted iron hub. The slots in the hub are designed to force air to the back of the sanding disk, keeping it cool under the most severe usage. The forced draft action through the spirals on the pad also tends to keep the abrasives clean, giving them longer life. 101

"Roto-Master" Portable Electric Hand Tool

A new light-weight, portable electric hand tool known as the "Roto-Master" has been introduced by the Master Appliance Co., Racine, Wis. This tool is capable of performing a wide range of operations on metal, wood, or plastic materials. It has been designed to save hours of tedious hand work. Because of its convenient size, it serves equally well when held in the hand or on



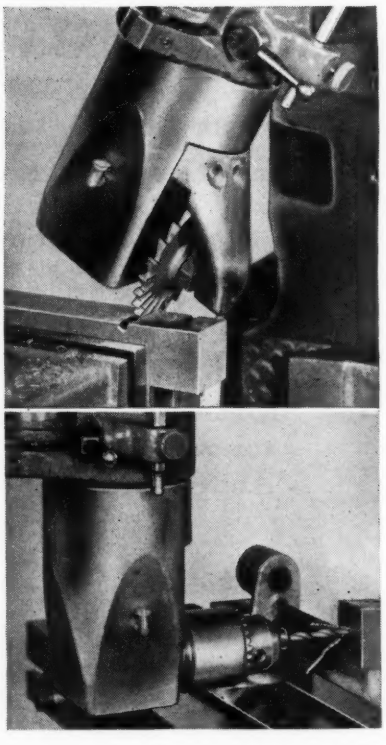
Portable Electric Hand Tool Placed on the Market by the Master Appliance Co.

a bench stand for grinding, routing, engraving, burring, and buffing. The motor runs at a speed of 30,000 R.P.M., and is cooled with a specially designed ventilating fan. It operates on alternating or direct current. 102

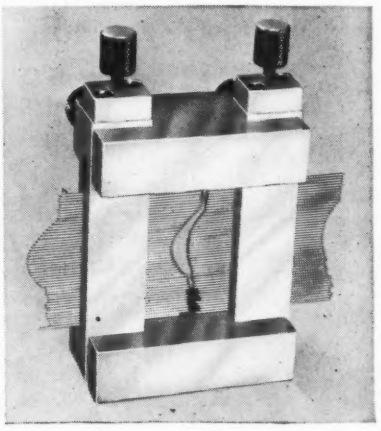
Bemis & Call Horizontal Milling Attachment

An auxiliary, precision, horizontal milling attachment designed to increase the scope of vertical milling machines and other machine tools has been announced by the Bemis & Call Co., Springfield, Mass. This milling head is adjustable to nearly any position. It will handle precision milling and drilling operations on a wide variety of work, and can be used for boring at any angle.

One or more cutters up to 4 inches in diameter can be used with this attachment. It will also take a standard chuck of 1/2-inch capacity for drilling, boring, and reaming at a 90-degree angle to the drive-shaft. The attachment has a gear ratio of 1 to 3, and is so designed that it can be easily and quickly installed. 103



(Upper View) Bemis & Call Milling Attachment. (Lower View) Attachment Set up for Horizontal Drilling Operation



Thompson Contour Transfer Gage

Contour Transfer Gage

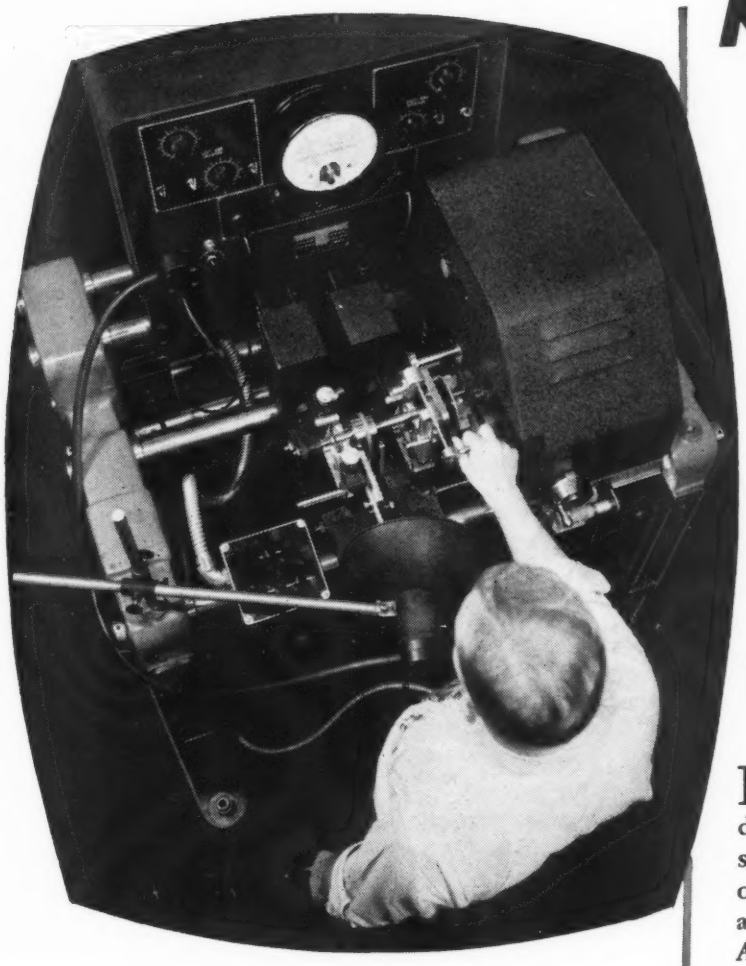
A simple, inexpensive contour transfer gage which provides means for reproducing many curves that are difficult to gage directly in a readily measurable form is being placed on the market by Thompson Products, Inc., Cleveland 17, Ohio. The gage is designed for measuring any radius or contour, and can be applied with equal facility and accuracy to the checking of die-cavity contours and production-line parts.

In conjunction with an optical comparator, the gage facilitates making a rapid, simple set-up for checking dimensions. A dial indicator or height gage can readily be used if desired. The contour transfer gage can be employed for the accurate measurement of such precision parts as turbine or compressor master blade patterns and production blade shapes, in either the rough, semi-finished, or finished condition. All pins in the gage are made accurately to size within 0.0002 inch. 104

To obtain additional information on equipment described on this page, see lower part of page 254.

1 MACHINE handles all 3 STEPS

of the complete balancing process!



1 *Locates and measures the unbalance*

2 *Corrects the unbalance*

3 *Inspects for over-all accuracy*

at the rate of 100 PIECES PER HOUR!

Balancing these fans for vacuum sweepers is now done completely on *one* machine. It takes only a few seconds to locate and measure the unbalance. Then, the operator turns the piece to the proper angle and turns a hand-wheel to correspond with the meter reading. At the press of a button, a fly-cutter removes the exact amount of metal to bring the part into balance. The part may be rechecked if desired.

The inclusion of correction equipment indicates the modern trend in balancing with Gisholt DYNETRIC Balancers. It saves handling—only one loading is required to complete all three steps.

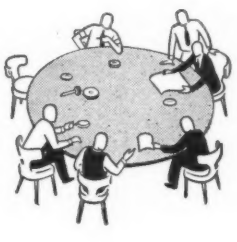
Those who are concerned with balancing of rotating parts have learned that it's wise to specify Gisholt.

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

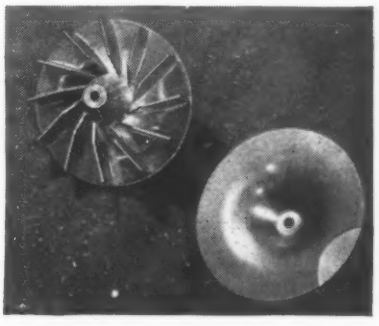
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface finishing, and balancing of round and partly round parts. Your problems are welcomed here.



Showing front and back of fan with metal removed to correct unbalance. The entire balancing operation required an average of less than 45 seconds per piece.



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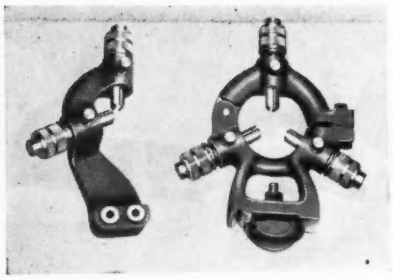


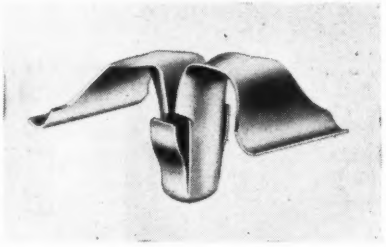
"De Luxe" Follower and Center Rests

South Bend Work Supports

To provide for quicker and more efficient operation on certain classes of lathe work, a "De Luxe" type follower rest and a center rest have been developed by the South Bend Lathe Works, 383 E. Madison St., South Bend 22, Ind. The principal features of these rests are the wrenchless adjustment and locking of the jaws. Each jaw has a knurled knob for adjusting its position and a thumb-screw for locking it in place. An ingeniously designed double-acting compound screw thread provides approximately 3/16 inch of jaw movement for each revolution of the adjusting knob. Smooth action, with just enough resistance to hold the jaw securely in position until it is locked with the thumb-screw, permits quick adjustment with high precision. The jaws are made of brass and slide through precision steel sleeves in the frame. 105

Shakeproof Push-In Snap Fasteners

A new style push-in type snap fastener stamped from spring steel, which forms a resilient, vibration-resistant lock to hold sheets, panels, brackets, and other sheet-metal parts in place, has been developed by Shakeproof, Inc., 2501 N. Keeler Ave., Chicago 39, Ill. The formed extended spring prongs stamped as an integral part of the fastener are compressed when the fastener is pushed through a punched or drilled hole, and spring out again on the far side of the joint to hold the assembly together under constant spring tension. The chief advantages of these new snap fasteners are reduced assembly time and material cost savings.



Push-in Type Snap Fastener Made by Shakeproof, Inc.

In operation, a quick push with the thumb seats the fastener securely, and no further rotation or setting operation is needed. 106

Brown & Sharpe Permanent-Magnet Chucks

The Brown & Sharpe Mfg. Co., Providence 1, R. I., has brought out a new line of permanent-magnet chucks that require no connection to electric lines. The rectangular model shown in Fig. 1, with its comparatively small working surface of 4 by 8 inches, is especially adapted for use on small surface grinding machines

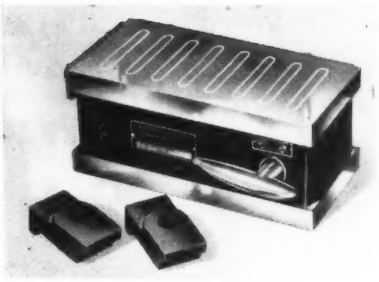


Fig. 1. B & S Permanent-magnet Type Rectangular Chuck

and bench grinders, as well as for bench work. This chuck is suited for both wet and dry grinding. The weight is about 25 pounds.

The two-line permanent-magnet chuck shown in the central view in Fig. 2 has a working surface of 4 by 12 inches, and has two-line pole spacers that make it suited for grinding rows of small parts, as well as larger single pieces. The strength of the magnetic force is regulated by the amount the control handle is turned. Two removable stop-plates are furnished, as in the case of the chuck shown in Fig. 1.

The rotary permanent-magnet chuck shown in the view to the left, Fig. 2, will hold work from 3/4 to 5 inches in diameter for grinding on cylindrical grinding machines and tool and disk grinders. It can also be used on polishing machines and on small lathes for work requiring light cuts. The chuck is suited for both wet and dry grinding. A tapped hole in the center of the top plate permits attaching a work-centering button. This chuck weighs 16 1/2 pounds.

The rotary model magnetic chuck shown at the right in Fig. 2 will hold work from 1 3/16 to 7 inches in diameter. A T-handle is used to apply and release the

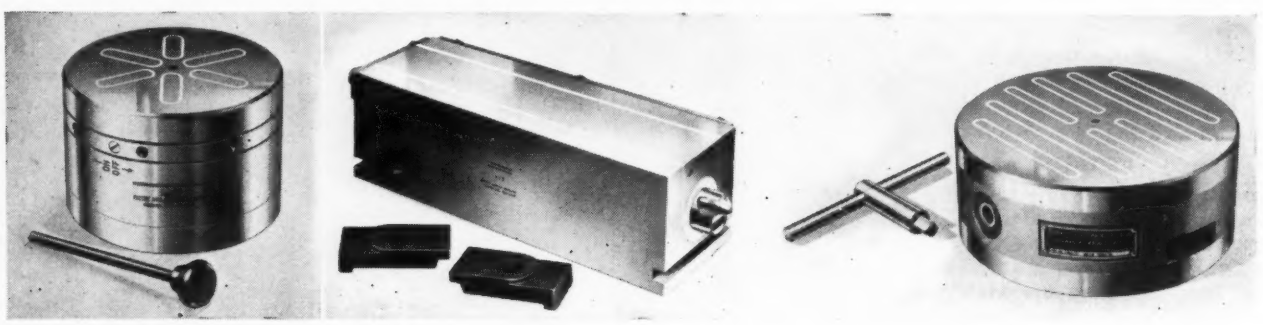


Fig. 2. (Left) B & S Rotary Permanent-magnet Chuck. (Center) Two-line Permanent-magnet Chuck for Holding Rows of Small Parts or One Large Part. (Right) Rotary Model B & S Permanent-magnet Chuck

To obtain additional information on equipment described on this page, see lower part of page 234.

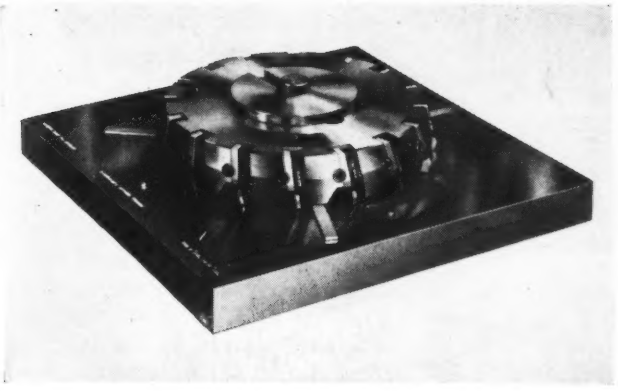


Fig. 1. Fixture Brought out by the Gairing Tool Co. for Rapid, Accurate Setting of "E-Con-O-Mill" Blades

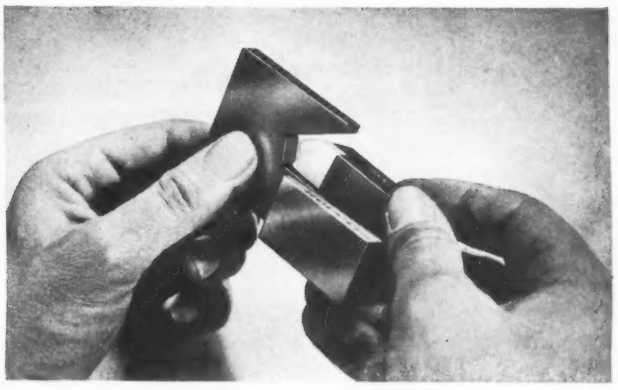


Fig. 2. Gage for Checking "E-Con-O-Mill" Blades before They are Assembled in the Body of the Face Mill

magnetic force and to adjust it to suit requirements. Adapters are available for mounting the chuck on the Brown & Sharpe No. 1 universal grinding machine and the No. 13 universal and tool grinding machines. This chuck has a working surface 7 inches in diameter and weighs approximately 23 1/2 pounds. 107

Viking Turning and Facing Tools with Inserted Carbide Tool Bits

A complete line of turning and facing tools embodying a mechanical locking device for inserted solid-carbide tool bits has been introduced by the Viking Tool Co., Shelton, Conn. The hardened semi-cylindrical wedge type lock located beneath the inserted bit is actuated by a screw, which locks or retracts the wedge, depending on its direction of rotation.

The tool-holder is designed to adequately support the carbide tool bit and to completely house both the locking mechanism and the tool bit, thus making it possible to employ the tool for extremely heavy cuts. It is made in shank sizes with tool heights from 3/4 inch to 2 inches, and in straight and offset styles. 108

"E-Con-O-Mill" Carbide-Blade Setting Fixture and Checking Gage

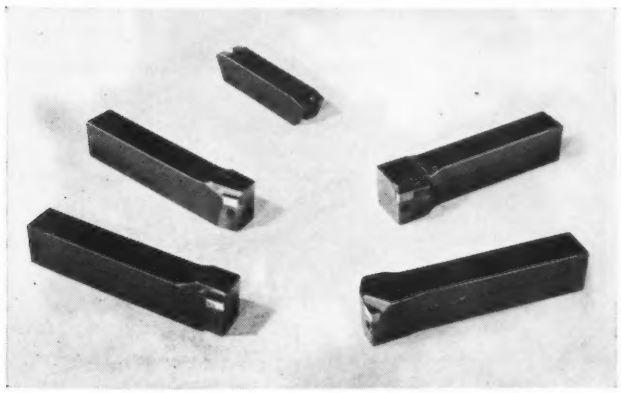
The Gairing Tool Co., 21225 Hoover Road, Detroit, Mich., has brought out a fixture designed, as shown in Fig. 1, for the rapid setting of new or reground carbide blades in the bodies of the improved "E-Con-O-Mill" face milling cutters described and illustrated on page 216 of April MACHINERY. The gage shown in Fig. 2 has also been developed for checking the blades after they have been sharpened or ground.

The assembling fixture assures accurate setting of the blades within 0.0015 inch. Should greater accuracy be required, a diamond wheel can be used to remove a maximum of 0.0015 inch from just the ends of the higher blades. In using the setting fixture, the body of the cutter is located on the plate by machined lugs which rest on three parallels having a thickness of 1/8 inch. The blades are inserted and pushed down until they touch the top of the plate, thus insuring a uniform projection of 1/8 inch beyond the lugs on the cutter body. 109

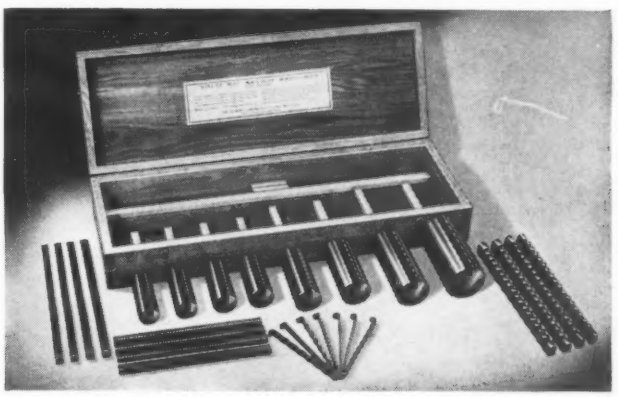
"Minute Man" Keyway Broach Kit

The du Mont Corporation, Greenfield, Mass., has announced an addition to its line of keyway broach kits for cutting all American standard keyway sizes. The new kits are available with carbon steel broaches and with high-speed steel broaches. Bushings are provided for hole sizes from 1/2 inch to 1 9/16 inches, varying by sixteenths of an inch.

With the "Minute Man" kit, it is only necessary to drop the right size bushing in the bore, place a

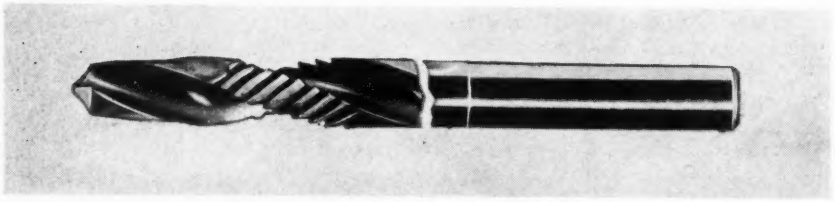


Viking Inserted Carbide Turning and Facing Tools



Keyway Broach Kit Made by du Mont Corporation

To obtain additional information on equipment described on this page, see lower part of page 234.



High-speed Drill-Reamer Developed by Severance Tool Industries, Inc.

broach of the desired width under the arbor press and in the bushing slot and press it through. The exact depth of the keyway is obtained by using shims which are provided in the kit. The broaches can be employed for cutting keyways in gears, milling cutters, pulley hubs, couplings, collars, and other parts. 110

Carbide Inserts for Wear Resistance and Rectangular Ejector Tools

The Super Tool Co., 21650 Hoover Road, Detroit 13, Mich., is now manufacturing parts subjected to wear with carbide inserts applied at the wearing points. The commercial stapler clinching die with carbide insert and the solid carbide wire guide shown in Fig. 1 are typical examples of these new products.

This company has also introduced a new vertical type ejector tool with a rectangular carbide insert, as illustrated in Fig. 2. This tool is offered in two styles. One—a straight holder for taking shoulder cuts—has a carbide insert located at a 15-degree lead angle or at right angles to the work. The other is an offset holder type designed for heavy roughing cuts, and is also available in a 15-degree lead angle or a right-angle model. Both holders can be furnished in designs adapted for holding the rectangular inserts either lengthwise or crosswise of the holder.

Carbide inserts 1 1/2 inches long are now being supplied for

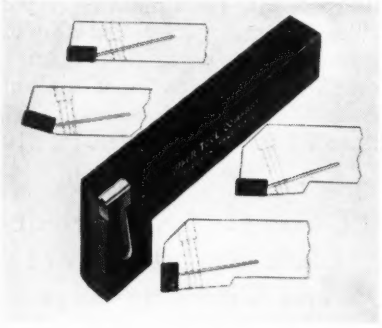


Fig. 2. Rectangular Ejector Tool with Carbide Insert Brought out by the Super Tool Co.

the company's ejector tools. The increased length of these inserts or bits permits about twelve additional grinds under normal conditions, which, on a square tool, provides forty-eight additional cutting faces. The new length bit has been adopted for the company's complete line of standard vertical ejector tool bits, including the square, round, triangular, and rectangular shapes. 111

Severance High-Speed Drill-Reamers

Drilling and reaming can be performed in one continuous stroke with the high-speed drill-reamers recently brought out by Severance Tool Industries, Inc., 636 Iowa St., Saginaw, Mich. These drill-reamers are being made in five sizes, ranging from 3/16 to 9/16 inch in diameter. The drill section of the tool provides for drilling through materials of any thickness up to that equalling its diameter. The drill-reamers have a liberal allowance for grinding the drill point a number of times.

The reamer section is designed with teeth of unusual shearing qualities, which are so arranged as to preclude chatter and expel the fine "wool-like" chips into the main flutes of the tool. It is claimed that this shearing action gives a superior finish and maintains a higher degree of accuracy with respect to the size of the hole. Solid carbide drill-reamers can be furnished to order when required. 112

Adjustable Bending Bar

Adjustable arms are a feature of a patented bending bar introduced by the Plomb Tool Co., Los Angeles 54, Calif. This tool eliminates the need for the usual assortment of solid bending bars, and will handle many jobs that would otherwise require a sledge hammer, pry bar, vise, or press. It is designed to save time, as well as to prevent injuries when making difficult bends.

More than one hundred different positions of the arms are pos-

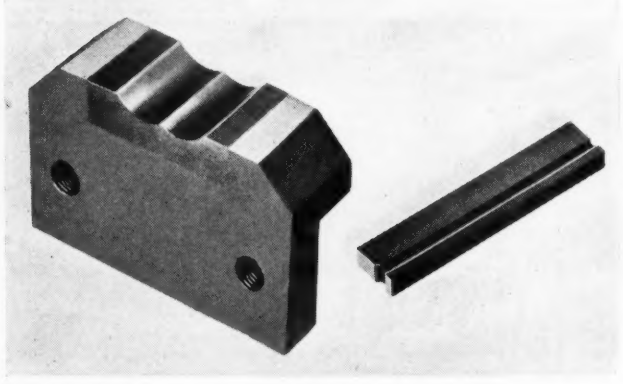
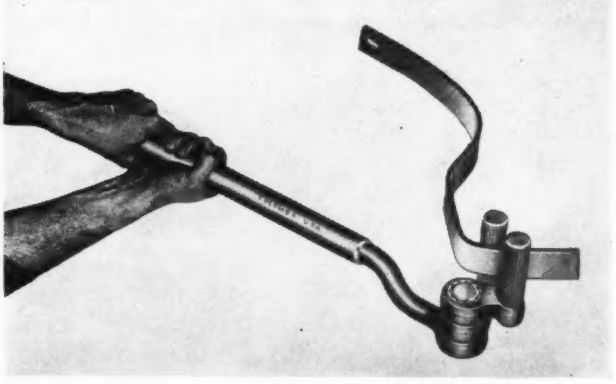
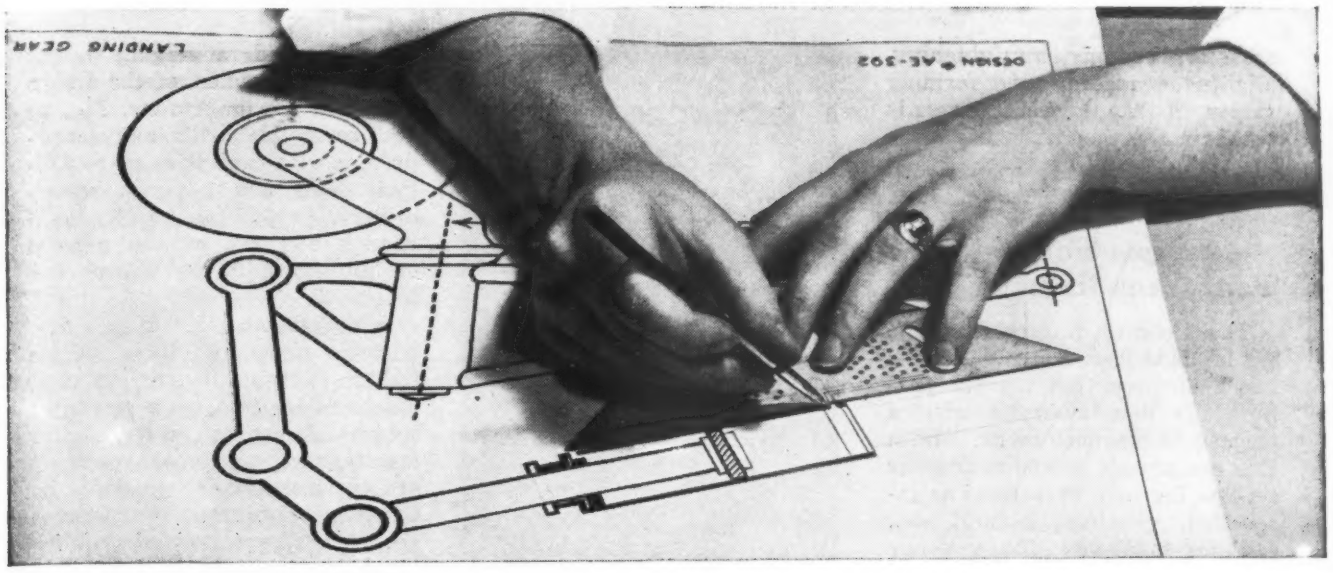


Fig. 1. Solid-carbide and Inserted-carbide Parts Made by the Super Tool Co.



Adjustable Bending Bar Introduced on the Market by the Plomb Co.

To obtain additional information on equipment described on this page, see lower part of page 234.



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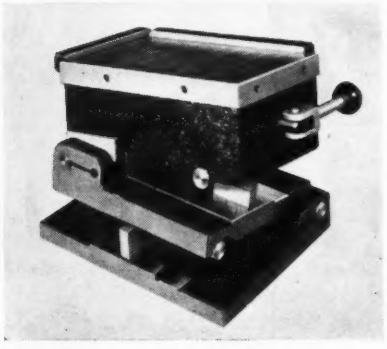
sible for bending, straightening, aligning, spreading, and forming various parts. Ample leverage is obtained for easy operation with the 36-inch handle. 113

"Magna-Sine" with Permanent-Magnet Chuck

The Robbins Engineering Co., 318 Midland Ave., Detroit 3, Mich., has announced that the "Magna-Sine" is now available with a permanent-magnet chuck. With this equipment, precision angular set-ups for such operations as inspection, grinding, boring, etc., can be made by the sine-bar method, using standard gage-



"Magna-Sine" with Permanent-magnet Chuck Made by the Robbins Engineering Co.

blocks. The "Magna-Sine" is built in models for single angles only, and in models for both single and compound angles. Both types or models are available in two sizes.

The new permanent-magnet chuck can be used for either wet or dry machining and grinding operations. The magnetic power is controlled by the amount the control handle is turned. Parts are not magnetized when removed from this chuck. 114

Buckeye "Stream-Power" Pneumatic Tools

A newly designed group of pneumatic tools known as the "Stream-Power" line has been introduced by the Buckeye Tools Corporation, Dayton 1, Ohio. This line comprises the following basic type tools with a number of models in each type: Horizontal grinders like the one shown in the upper view of Fig. 1, which cover a

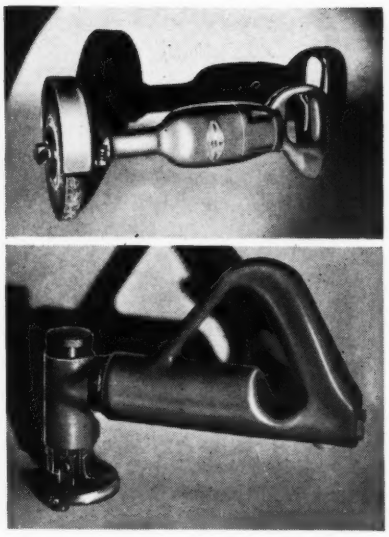


Fig. 1. (Top) Buckeye "Stream-Power" Pneumatic Horizontal Grinder. (Bottom) Buckeye Pneumatic Shear

speed range of 3000 to 22,000 R.P.M., weigh 1 to 12 pounds, and have a wheel size capacity of 1/2 inch to 8 inches in diameter; shears weighing from 3 to 6 pounds, with up to 14-gage maximum capacity, the 5 5/8-pound size being shown in the lower view, Fig. 1; nibblers for cutting or nibbling up to 20-gage sheet metal and weighing from 2 1/2 to 4 pounds, of the type shown in the center view of Fig. 2; air wrenches with up to 5/8-inch nut

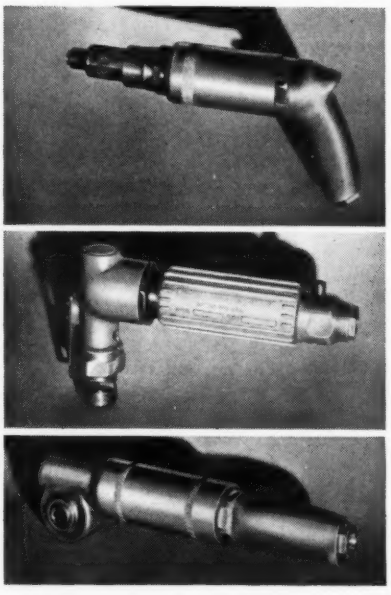
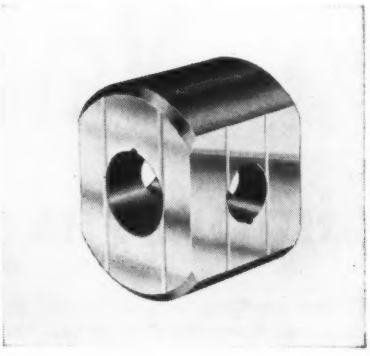


Fig. 2. (Top) "Stream-Power" Pneumatic Screwdriver. (Center) Buckeye Nibbler. (Bottom) "Stream-Power" Air Wrench

capacities and ranging in weight from 3 to 6 pounds, of the design shown in the lower view, Fig. 2; and reversible drills and screwdrivers with capacities up to 3/8-inch drills and 1/4-inch screwdrivers, which weigh 3 to 5 pounds and are of the general design shown in the upper view in Fig. 2.

Improvements in these new portable pneumatic tools include lighter weight, better balance, quieter operation, new governor control, increased power, easier maintenance, and more compact proportions, made possible by using magnesium-alloy castings, neoprene valve seats, and stainless high-carbon steel parts. 115



Universal-joint Center Block with Grooved Faces Developed by the Curtis Universal Joint Co.

Curtis Universal Joint with Low-Friction Center Block

New center blocks for universal joints developed by the Curtis Universal Joint Co., Inc., Springfield, Mass., are said to permit the joints to run much cooler and be unaffected in overload tests at excessive torque and angles that cause failure and "freezing" of ordinary joints through frictional heat. Two shallow grooves, such as shown in the illustration, which are cut on each of the four bearing surfaces of the center block break each surface into four smaller areas, making a total of sixteen small bearing surfaces instead of the usual four larger surfaces.

The reduction in the size of the areas subjected to friction is said to result in a more even distribution of wear and to conduct oil more effectively for the lubrication of the wearing surfaces; the

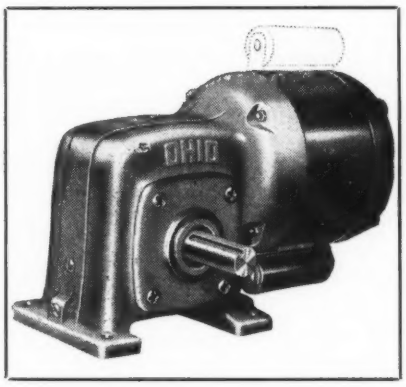
To obtain additional information on equipment described on this page, see lower part of page 234.

kinetic energy or frictional heat is also dissipated more uniformly and rapidly. 116

Ohio Motorized Speed Reducers

A new line of motorized speed reducers in 1/4-H.P. and 1/3-H.P. capacities is announced by the Ohio Gear Co., 1311 E. 179th St., Cleveland, Ohio. These speed reducers are designated Series M-1400 and M-1300. They are made in ratios of from 5 to 1 up to 72 to 1, with output speeds of 317 R.P.M. to 24 R.P.M. Output torque ranges from 43 inch-pounds to 354 inch-pounds. Worm and motor shaft are integral, and are made of hardened steel and ball-bearing mounted.

Two types of general-purpose motors are available—a capacitor type, of 115 or 230 volts, and a three-phase type of 220 to 440 volts. A special feature is the new "Torq Syncrosnap" starting switch which insures precise snap action and eliminates damage from



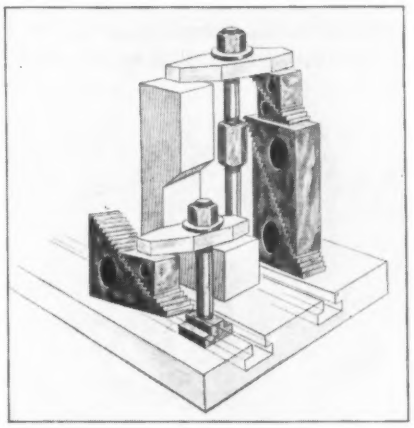
Motorized Speed Reducer Brought out by the Ohio Gear Co.

burned-out windings. The capacitor may be mounted above or below the motor. 117

Set-Up Stud Sets and Adjustable Step Blocks

The Northwestern Tool & Engineering Co., 117 Hollier Ave., Dayton 3, Ohio, has announced a line of handy set-up stud sets with a selection of T-nuts for slotted machine tables in sizes that increase by increments of 1/16 inch from 7/16 to 7/8 inch. Each set consists of six T-nuts, four coupling nuts, and four studs of six different lengths each, ranging from 3 to 8 inches. Lengths up to 15 inches can be obtained by using the coupling nuts included with the set.

Adjustable step blocks, such as shown in the illustration, have also been announced by this company. These blocks are designed to reduce set-up time and protect



Northwestern Step Type Set-up Blocks

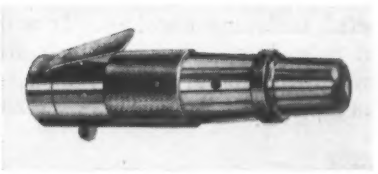
table surfaces on punch presses, milling machines, jig borers, slotters, etc. The use of the step blocks eliminates the need for shims, since they are manufactured in 1/16-inch steps. These blocks are available in various sizes. 118

Elgin Pneumatic Hammer for High-Speed Work

An improved pneumatic hammer designed to operate with minimum vibration is a new product of the Borm Mfg. Co., Elgin, Ill. Outstanding features of the new unit, known as the Elgin Model G utility hammer, include sturdy, compact construction; great striking power; combination locking type tool-holder, which eliminates danger of falling or flying tools; and trigger air control.

The hammer is 8 inches long, and has a bore of 7/8 inch, a stroke of 5/8 inch, and a speed of 5000 strokes per minute when operated by an air pressure of 100 pounds per square inch. The air consumption at this pressure is about 5 cubic feet per minute. The weight is 3 1/2 pounds.

The hammer is adapted for

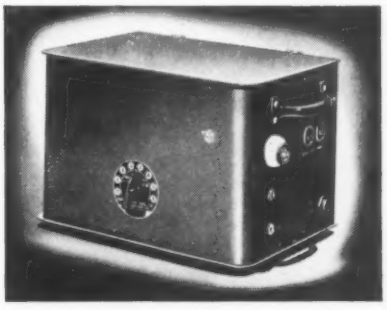


Elgin Pneumatic Hammer Made by Borm Mfg. Co.

scaling and cleaning welds; die work; chipping operations; chisel work; cutting light-gage metal; general maintenance work; and similar jobs. 119

Disintegrating Type Boring Machine

The Electro Arc Mfg. Co., 5930 Commonwealth Ave., Detroit, Mich., has announced a new "Electro Arc" boring machine which disintegrates broken taps, drills, end-mills, reamers, screws, studs, and similar work without changing the temper of the metal. This machine will cut any size or shape of hole in steel or other



Electro Arc Equipment for Disintegrating Broken Tools

To obtain additional information on equipment described on this page, see lower part of page 234.

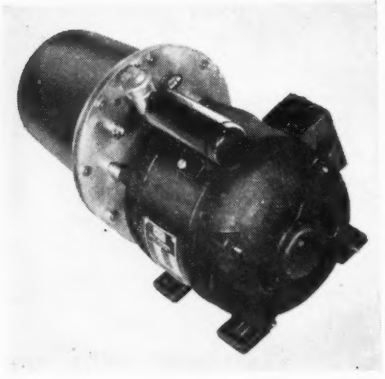
metal, including carbides. It will cut holes from 0.040 to 1 inch diameter in round, square, hexagonal, U, and bar shapes. 120

Midget Hydraulic Unit

The John Dusenbery Co., 150 Pine St., Montclair, N. J., has brought out a new hydraulic unit that is adapted for automatic or remote control of hydraulic cylinders and can also be used as a substitute for compressed air when the latter is not available from a plant supply line. This unit was added to the company's 6-volt units in response to numerous requests from industry for 110-, 220-, and 440-volt single or polyphase units.

The new unit involves little or no installation cost and requires a minimum of floor space. It can be mounted on either the floor or wall. It is available with pumps of various capacities and pressures and includes a 5-pint capacity reservoir and an electric motor.

Most of these units can be supplied with a pressure relief valve and check valve, mounted inside the tank or externally. 121



Dusenbery Midget Control Unit for Hydraulic Systems

Mobile Coolant Filter and Sump Cleaner

The Honan-Crane Corporation, 912 Sixth St., Lebanon, Ind., has just added to its line of oil and coolant clarification equipment a mobile machine tool coolant filter. The new unit, as shown in Fig. 1, is mounted on four wheels, is equipped with motor and vacuum pump, and operates on a continuous circulation system from a suction hose through the filter tank and discharge hose. The flow rate is 12 gallons per minute.

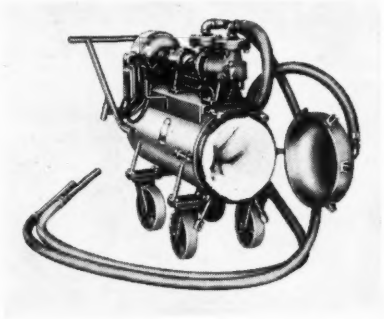


Fig. 1. Honan-Crane Mobile Coolant Filter

A redesigned sump cleaner, also announced by this company, is shown in Fig. 2. This unit quickly removes chips, grindings, cutting oil, or soluble coolant from machine tool sumps or scale and other contamination from quench and settling tanks. The sump cleaner transfers the oil or coolant from the sump to the tank by vacuum, no contaminating liquid being passed through the pump. The unit can also be used for dispensing clean liquid. Two sizes are available having capacities of 80 and 125 gallons. A 1/2-H.P. motor is provided. 122

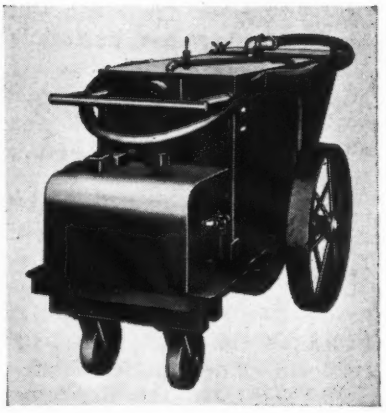


Fig. 2. Sump Cleaner brought out by the Honan-Crane Corporation

* * *

The Chinese National Government has approved a contract with the Reynolds Metals Co. to operate an aluminum industry in China on a partnership basis. This is the first time that a private American company has been granted partnership in a major Chinese industry on a basis of equality with the government.

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in June, 1948, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME..... POSITION OR TITLE.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

CITY..... STATE.....

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 240 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the June, 1948, Number of MACHINERY

Tap Handbook

SHEFFIELD CORPORATION, Dayton 1, Ohio. Catalogue 48-3, comprising a 64-page handbook of tap data and catalogue information on Sheffield high-speed commercial and precision-ground taps. Copies can be obtained if requested on a company letter-head addressed directly to the Sheffield Corporation.

Screw Machines and Precision Boring Machines

NEW BRITAIN-GRIDLEY MACHINE DIVISION, NEW BRITAIN MACHINE CO., New Britain, Conn. First of a series of case histories entitled "It Can be Done," describing ten examples of how manufacturers have increased production and reduced costs in using multiple-spindle chucking and screw machines and precision boring machines. 1

Multiple-Spindle Drilling and Tapping Machines

NATIONAL AUTOMATIC TOOL CO., Department 40, Richmond, Ind. Bulletin containing complete specifications covering the new Natco H-5 and H-6 standard and heavy-duty, high-speed, sensitive multiple-spindle drilling and tapping machines for producing holes in small steel, cast-iron, plastic, wood, or aluminum parts. 2

Grinding with Oil

D. A. STUART OIL CO., LTD., 2739 S. Troy St., Chicago 23, Ill. Booklet entitled "Grinding with Oil," comprising a combined catalogue and handbook of grinding information, including the selection of proper oils and grinding wheels; wheel marking systems; chart of standard wheel shapes; and suggestions for handling grinding oils. 3

Power Transmitting and Conveying Equipment

LINK-BELT CO., 300 W. Pershing Road, Chicago 9, Ill. Catalogue 850, containing 180 pages covering the Link-Belt standard line of power transmitting and conveying machinery, including chains, sprockets, hangers, couplings, clutches, pulleys, gears, conveyor belts, speed reducers, etc. 4

Plug and Thread Gages

SIZE CONTROL CO., DIVISION AMERICAN GAGE & MACHINE CO., 2500 Washington Blvd., Chicago 12, Ill. Catalogue 48, containing specifications and prices on the company's line of reversible plug and thread gages, snap gages, ring gages, taper pipe thread plug and ring gages, and measuring wires, as well as centerless lapping machines. 5

Carboloy Insert Tools

CARBOLOY COMPANY, INC., 11147 E. 8 Mile Avenue, Detroit 32, Mich. Supplement to the company's general tool catalogue GT-200, covering the expanded line of Carboloy insert tools with mechanically held solid Carboloy cemented-carbide bits. The bulletin includes grinding, set-up, and adjusting instructions. 6

Bearing Application

NEW DEPARTURE DIVISION, GENERAL MOTORS CORPORATION, Bristol, Conn. Booklet AP, entitled "Outline of Procedure in Bearing Application," the fifth in a series of Engineering Service books, describing the principal steps in developing a successful ball-bearing mounting. 7

Tools and Attachments

BROWN & SHARPE MFG. CO., Providence 1, R. I. Circulars descriptive of a ball attachment for micrometers and a new center and small-hole attachment for vernier calipers. Leaflet illustrating and describing the new B & S dial test indicator with fine adjustment and magnetic base. 8

Abrasion-Resisting Steel Plates

JOSEPH T. RYERSON & SON, INC., P.O. Box 8000-A, Chicago 80, Ill. Bulletin describing abrasion-resisting steel plates and sheets and giving typical applications and performance records, as well as information on heat-treatment and fabrication. 9

Recessing Tool Manual

SCULLY-JONES & CO., 1901 S. Rockwell St., Chicago 8, Ill. Reference manual No. 17-2, containing comprehensive engineering data on the company's line of automatic recessing tools. Operating instructions, application suggestions, and production data are included. 10

Roller Bearings

ROLLWAY BEARING CO., INC., Syracuse, N. Y. Catalogue 847, containing dimensions, load ratings, and other pertinent information on "Tru-Rol" steel-cage type cylindrical roller bearings. Engineering data on the selection and installation of these bearings is included. 11

BROACHING CUTS COSTS FASTER!

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

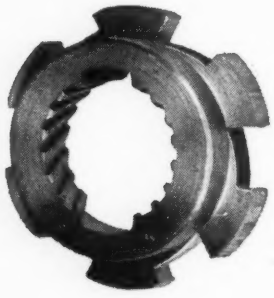
BEST BY TEST

Colonial broaches represent the fastest, surest, precision method there is for removing metal. May be used equally effectively for all kinds of internal or external shapes, regular or irregular.

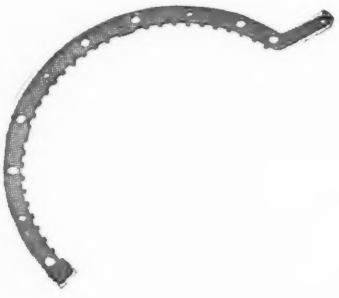
Wherever they CAN be used, they are bound to give you greater output per machine hour—and that means REAL SAVINGS—savings that pay for the tooling cost in a surprisingly short time.

There's a Colonial field representative near you. Ask us to have him figure where and how much *you* can save; how much you can boost your output per machine hour.

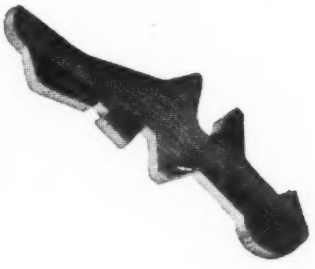
STEEL — BRONZE — COPPER



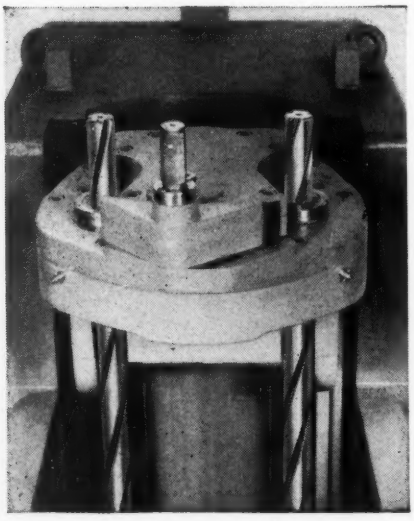
Internal Gears and Splines



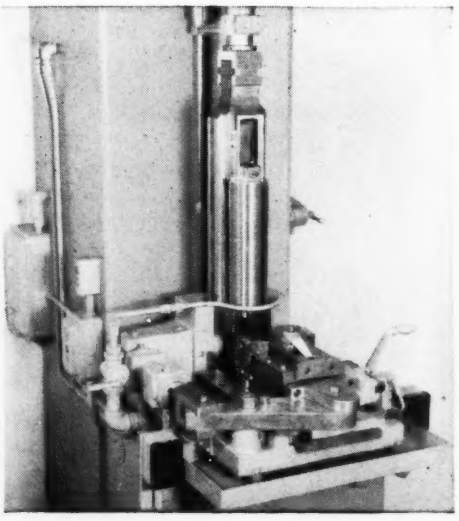
Telephone Relay Parts



Electrical Breaker Arms



One pass of the broach and the internal gear or spline is finish-cut. Accuracy is insured by Colonial's specially developed involute and other broach checkers and grinding methods.



It is impossible by any other method to maintain the accuracy of the cam teeth on parts like these while getting the production obtained with Colonial Broaches (360 per hour at 85% efficiency).

800 to 1000 pieces per hour on one machine with the two sets of Colonial broaches shown here (one set also 'disassembled' to show simplicity). Parts are broached 8 at a time.

Roll Grinders

FARREL-BIRMINGHAM CO., INC., 344 Vulcan St., Buffalo 7, N. Y. Bulletin 115, containing complete information on the design and construction of the Farrel heavy-duty roll grinder. Specifications, dimensions, and weights are included. 12

Optical Inspecting and Measuring Instrument

GEORGE SCHERR CO., INC., 200 Lafayette St., New York 12, N. Y. Folder descriptive of two models of the Wilder Micro Projector, one of which has been developed for continuous quantity inspection of precision parts. 13

Buffing and Polishing Machine

VANOTT MACHINE CORPORATION, 240 Colgate Ave., Buffalo 20, N. Y. Circular describing a new automatic electrically driven eight-spindle buffing and polishing machine for finishing small parts at a high rate of production. 14

Abrasive-Belt Machines and Portable Electric Tools

PORTER-CABLE MACHINE CO., 1714 N. Salina St., Syracuse 8, N. Y. Miniature catalogue, containing 20 pages descriptive of the company's complete line of abrasive-belt machines and portable electric tools. 15

Hydraulic and Hand-Operated Presses

GREENERD ARBOR PRESS CO., Nashua, N. H. Bulletin 112, descriptive of Greenerd hydraulic gap presses. Catalogue 40, illustrating and describing Greenerd hydraulic and hand-operated arbor presses. 16

Carbide-Tipped Tools

CHICAGO LATROBE TWIST DRILL WORKS, 411 Ontario St., Chicago 10, Ill. Catalogue on Chicago Latrobe "Harduty" carbide-tipped drills, containing complete information on the care, set-up, use, and sharpening of these tools. 17

Sheet-Metal Fabricating Machine

WALES-STRIPPIT CORPORATION, North Tonawanda, N. Y. Catalogue 10-A, describing in detail the features of the new Wales sheet-metal fabricator with Hydra-New-Matic drive. 18

Carbide Cutting Tools

WENDT-SONIS CO., Hannibal, Mo. Catalogue 646, covering the complete line of carbide cutting tools made by this concern, including solid carbide rotary files, grooving tools, adjustable reamers, inserted-tooth cutters, and other tools. 19

Hydraulic Presses

VERSON ALLSTEEL PRESS CO., 9309 S. Kenwood Ave., Chicago 19, Ill. Catalogue H-47, giving complete details and specifications on the Verson line of hydraulic presses and the new Hydrol speed circuit. 20

Cutting Fluids

STANDARD OIL CO. OF NEW JERSEY, 15 W. 51st St., New York 19, N. Y. Catalogue D239-J4, containing detailed recommendations for the selection of cutting fluids and information on their proper use. 21

Ejector Type Tools

SUPER TOOL CO., 21650 Hoover Road, Detroit 13, Mich. Application manual No. 348, describing typical applications of twenty different styles of ejector type tools with solid carbide replaceable bits. Size and price data are included. 22

Ceramic Surface Plates

NORTON CO., Worcester 6, Mass. Circular illustrating and describing the new Norton ceramic surface plate, which is said to have a flatter, smoother, and longer-lived surface than previous designs. 23

Precision Gage-Blocks

WEBBER GAGE CO., 12900 Triskett Road, Cleveland 11, Ohio. Catalogue entitled "Precise Measurement is the Critical Factor in Quality Control," containing data on Webber micro-accurate gage-blocks and their application. 24

Pressed-Steel Detachable Chain

CHAIN BELT CO., 1600 W. Bruce St., Milwaukee 4, Wis. Bulletin 48-26, containing complete specifications and price lists covering Rex pressed - steel detachable chain. 25

Strip and Sheet Feeding Tables

LYON - RAYMOND CORPORATION, 5136 Madison St., Greene, N. Y. Bulletin 260, describing hydraulic strip and sheet feeding tables available in capacities of 2000, 4000, and 6000 pounds. 26

Hydraulic Presses

HYDRAULIC PRESS MFG. CO., Mount Gilead, Ohio. Stock list of hydraulic metal-working presses, die-casting machines, plastic molding machines, and other hydraulic equipment available for quick delivery. 27

Precision Gage-Blocks

JANSSON GAGE CO., 19208 Glendale Ave., Detroit 23, Mich. Booklet containing data on Jansson gage-blocks which provide a method of making measurements that are accurate to millionths of an inch. 28

Lead-Screw Tapping Machine

CLEVELAND TAPPING MACHINE CO., Hartville, Ohio. Bulletin descriptive of the new Cleveland lead-screw tapping machine for single or multiple small-hole production tapping. 29

Turned and Ground Steel Shafts

CUMBERLAND STEEL CO., Cumberland, Md. Circular covering the advantages, tolerances, and weights of Cumberland turned and ground steel shafts. 30

Transmission Equipment

WESTERN MFG. CO., 3400 Scotten Ave., Detroit 10, Mich. Catalogue completely describing Western transmissions ranging up to 30 H.P. for motorizing cone-driven machine tools. 31

Gear Chucks

GARRISON MACHINE WORKS, INC., 515-525 Bannock St., Dayton 4, Ohio. Folder entitled "How Much Are You Losing by Not Using Garrison Pitch-Line Control Gear Chucks?" 32

Roller Bearings

ROLLER BEARING CO. OF AMERICA, Trenton 3, N. J. Engineering data book and catalogue covering the company's entire line of roller bearings. Engineering information is included. 33

Motorless Speed Reducers

JANETTE MFG. CO., 556-558 W. Monroe St., Chicago 6, Ill. Price list 10-27, covering Janette motorless speed reducers ranging from 1/20 to 10 H.P. 34

Lubrication of Industrial Gears

TEXAS CO., 135 E. 42nd St., New York 17, N. Y. Complete technical information on the lubrication of industrial gears is contained in the June issue of *Lubrication*. 35

Galvanic Corrosion

INTERNATIONAL NICKEL CO., 67 Wall St., New York 5, N. Y. Booklet describing various aspects of galvanic corrosion and giving data on how galvanic effects can be minimized. 36

Universal Gage

PENJASKA TOOL CO., Box 210, Owosso, Mich. Folder describing a new universal gage for quickly measuring the form and size of holes in tool, die, and production work. 37

Multiple-Spindle Drill Heads

THRIFTMASTER PRODUCTS CORPORATION, 1048 N. Plum St., Lancaster, Pa. Circular giving complete specifications for Thriftmaster multiple - spindle drill heads. 38

Plastic Preforming Press

DEFIANCE MACHINE WORKS, INC., Defiance, Ohio. Catalogue describing the construction features of the Defiance No. 45 plastic preform press. 39

Flexible-Shaft Machine

ELECTRO MECHANO CO., 261 E. Erie St., Milwaukee 2, Wis. Bulletin descriptive of the "Speed-Right" flexible-shaft machine for hand milling and grinding. 40

Vibrating Work-Loader

LANDIS TOOL CO., Waynesboro, Pa. Bulletin VL-48, descriptive of the Landis vibrating type work-loader for centerless grinding machines. 41

Bolts and Nuts

STERLING BOLT CO., 209 W. Jackson Blvd., Chicago 6, Ill. Stock list of nuts, bolts, screws, rivets, and washers available for immediate delivery. 42

Flexible Couplings

MORSE CHAIN CO., 7601 Central Ave., Detroit 8, Mich. Catalogue C41-48, containing 32 pages of data on the "Morflex" flexible coupling line. 43

Rust-Preventive Oil

OAKITE PRODUCTS, INC., 34 E. Thames St., New York 6, N. Y. Service report entitled "Rust Prevention with Oakite Special Protective Oil." 44

Speed Selector

B. F. GOODRICH CO., Akron, Ohio. Pamphlet descriptive of the Goodrich variable planetary speed selector, by means of which stepless, infinite ratio changes in speed are obtainable. 45

Clutches

CARLYLE JOHNSON MACHINE CO., Manchester, Conn. Installation and data book No. 47, containing information on Maxitorq floating disk clutches. 46

Ball Type Joints

CURTIS UNIVERSAL JOINT CO., INC., Springfield, Mass. Folder describing the features of the new Curtis ball type joint, designed especially for light-duty work. 47

Chromium-Plating Data

CHROMIUM CORPORATION OF AMERICA, 120 Broadway, New York 5, N. Y. Catalogue 27, containing 36 pages of information on industrial chromium-plating and its application. 48

Power Transmission Equipment

MEDART CO., 100 Potomac St., St. Louis 18, Mo. Catalogue 77, containing 107 pages covering the complete line of Medart power transmission equipment. 49

Aluminum-Bronze Rolled Sheet and Plate

AMPCO METAL, INC., Milwaukee 4, Wis. Bulletin 94, describing the advantages of Ampco rolled sheet and plate. 50

Gages

NILSSON GAGE CO., INC., Poughkeepsie, N. Y. Booklet covering the new Nilsson dial snap gage, large-dial bore gage, and small-dial bore gage. 51

Electric Counters

PRODUCTION INSTRUMENT CO., 700-26 W. Jackson Blvd., Chicago 6, Ill. Bulletin ES-91, showing a wide variety of electric counter applications. 52

Rebuilt Machine Tools

MILES MACHINERY CO., Saginaw, Mich. Catalogue 188, listing a wide variety of rebuilt machine tools. 53

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (June, 1948) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

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[This service is for those in charge of shop and engineering work in manufacturing plants.]

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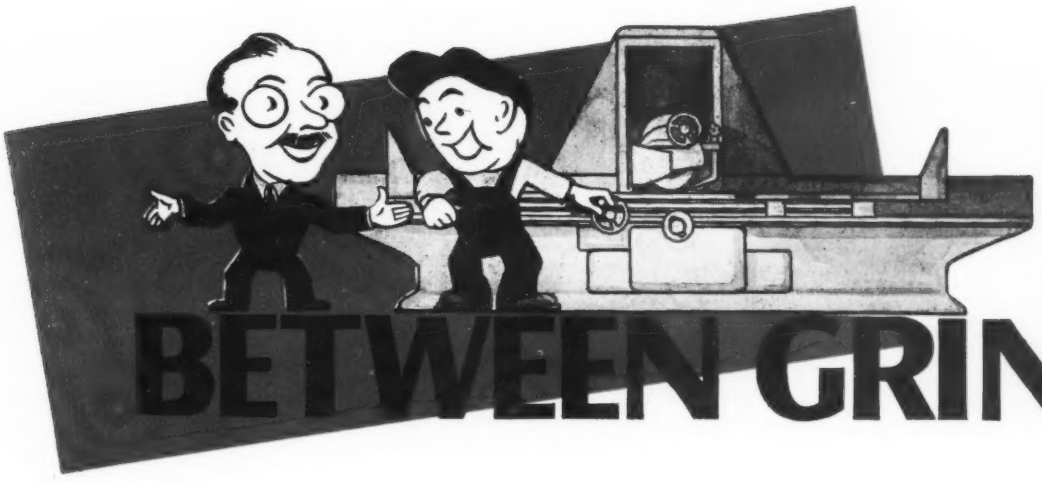


By E.S.S.

BETWEEN GRINDS

Compliment De Luxe

A Hungarian firm, writing to us for information about machines for the production of files, introduced themselves thusly: "We are assiduous and perseverant readers of your very interesting magazine."

We Must Be Current

Thirty-nine years ago, a young apprentice, John Homewood by name, took his mathematical troubles to the then-editor of MACHINERY (Fred E. Rogers) and received a most detailed reply, the latter subsequently basing a short article on the problem involved (Vol. XV, April, 1909, page 632). The apprentice kept the letter and article, "proud that his curiosity inspired the editor to write the problem up in such an interesting form." Recently, while browsing through his files, he came across the letter and wrote to the now-editor, suggesting that the article be republished "because of its unusual interest —especially its mathematical application to shop problems." Don't tempt us, John—that would be an easy way of keeping our editorial larder well stocked—by republishing all the best that has been presented down through the years.

Mother and/or Teacher Knows Best

A Canadian student wrote to us in French of his interest in MACHINERY'S HANDBOOK and stated that he would like to purchase one, but wished to know how much it would cost him "car ma mere dit que c'est du superflu, mais le maitre dit le contraire" (for my mother says that it is superfluous, but the teacher says the contrary).

Deucedly Derivative

The proprietor of a book and magazine store in Lagos, Nigeria, has customers who wish to purchase our magazine. Writing to us in English that is definitely basic, Prop. states he would like us to send a sample copy of MACHINERY to him because "it is impossible for me to buy a pig in a bag." We sympathize with you, Prop.—does the Lagosian butcher quick-like put your meat in a bag, too? And is that why your English depicts so graphically (if at our expense) the unknown?

Wanted! A Solution

A manufacturer of screw machine products consulted us on a problem of wasted time in his plant as the result of an inconveniently located stock-room and tool-crib, necessitating a walk the equivalent of two or three blocks in order to get even so small an item as a cap-screw or tool bit. Two solutions—one of moving the stores to a central location and the other of introducing an overhead basket conveyor system—had been ruled out (thus forestalling the snap answers we had ready). Carrier pigeons and roller skates crossed our mind, but dismissing them as somewhat unconventional, we replied: "We would think that an efficient messenger service might meet your needs. You could probably have boxes placed on the various foremen's desks to receive requisitions on the tool-crib or stock-room for new tools or supplies and have a messenger make periodic calls to those desks. The same messenger could deliver all tools except those of considerable weight. Also, telephone calls to the tool-crib could be made for emergency needs."

Camera Snaps Our Printing Face

An instructor in the School of Engineering at George Washington University wrote to us just the other day: "My class in machine design is designing a punch press for a term problem. Your magazine MACHINERY in the July, August, September, and October issues for 1923 has a very helpful article 'Design of Punching and Shearing Machines' by A. Louis Jenkins. These issues in bound volumes are on reference at the Library of Congress but they may not be taken out. I would like to have your permission to have the article photostated." With age no barrier in college anyway, we are delighted to have our picture (the 1923 article, that is) taken for the collegiate crowd.

Try-Out

An Italian organization on MACHINERY'S subscription lists abbreviates its full name so that it reads like the notes in the scale: Or. Ve. Ma. S. p. Az. We sound better descending.

News of the Industry

California, Oregon, and Colorado

J. J. BUCKLEY was recently elected president of the Pacific Tube Co., Los Angeles, Calif. Since 1944 he has held the position of vice-president and general manager. Previous to becoming connected with this company, he was associated with the Superior Tube Co. Among other changes announced was the election of E. H. LLOYD as vice-president. He was previously plant superintendent.

DIAMOND MACHINE TOOL CO., 3429 E. Olympic Blvd., Los Angeles, Calif., manufacturer of open-back inclinable punch presses and milling machines, announced that it has purchased the complete line of power shears and Multi-Max punch presses previously manufactured by the Parker Mfg. Co., Santa Monica, Calif. There will be no interruption in the production of these machines.

STERLING TOOL PRODUCTS CO., Chicago, Ill., manufacturer of portable electric- and air-driven sanding machines, announces the establishment of a new sales office and service depot at 405 W. Washington St., Los Angeles, Calif. I. C. BOUCHARD, west coast district manager, will be in charge.

BUFFALO FORGE CO., Buffalo 5, N. Y., announces the appointment of the ECCLES-GERMAIN MACHINERY CO., 1910 Santa Fé Ave., Los Angeles, Calif., as distributor in the Los Angeles area for the company's line of punches, shears, bar cutters, bending rolls, and the larger power drills.

PAUL R. OLIVER has been named West Coast manager for the Farrel-Birmingham Co., Inc., Ansonia, Conn., with headquarters at the company's office, 2039 Santa Fe Ave., Los Angeles, Calif. He has worked as service engineer for the company since 1942.

REYPO CORPORATION, manufacturer of drill presses, announces the recent consolidation of the main office and factory in the company's new building at 5751 W. 98th St., Los Angeles, 45, Calif.

THOMAS T. PARKER has recently joined the Hyster Co., Portland, Ore., manufacturer of lift-trucks, in the capacity of pressed-metal manufacturing engineer. He was previously assistant to the superintendent of the By-Products Steel Corporation, Coatesville, Pa.

GEOFFROY CO., Denver 6, Colo., has been appointed exclusive representative in Colorado, Utah, and Wyoming for the MEINHARDT DIAMOND TOOL CO., of Chicago, Ill.

Georgia and Texas

M. H. COURTENAY has been appointed Atlanta, Ga., district manager of S K F Industries Inc., Philadelphia, Pa., manufacturer of ball and roller bearings. Mr. Courtenay succeeds NILES MILLER, who has retired after thirty years of service with the company.

ROBERT L. LEDBETTER has been appointed sales representative for the Buckeye Tools Corporation, Dayton, Ohio, in the Texas and Oklahoma territory.

Illinois and Indiana

LINDBERG ENGINEERING CO., 2444 W. Hubbard St., Chicago, Ill., manufacturer of heat-treating and melting furnaces, has acquired the assets of the Electronics Division of the Illinois Tool Works, Chicago, Ill., and will continue the manufacture and sale of high-frequency induction and dielectric heating equipment. Operations will be moved from the Illinois Tool Works plant into the Lindberg plant on June 1. JOHN A. CALLANAN, who headed this division of the Illinois Tool Co., and his staff will join the Lindberg organization. As a result of this and other recent expansions in the business, a new building with a floor area of 15,000 square feet will be erected on property adjoining the present Lindberg plant.

INDEPENDENT PNEUMATIC TOOL CO., Aurora, Ill., manufacturer of Thor portable power tools, announces the opening of a new administration building adjacent to its main works in Aurora, where the entire executive and administrative staff is now located. The new building provides 40,000 square feet of office space on two floors and an additional 35,000 square feet of space for machine shop, factory, and steel storage.

W. E. FALBERG, for the last three years head of special steel sales at the Cleveland, Ohio, steel-service plant of Joseph T. Ryerson & Son Inc., has been appointed manager of alloy and stainless steel sales at the company's plant in Chicago, Ill. E. H. BODENMANN, formerly a sales representative in the stainless steel department of the Ryerson plant at Chicago, has been transferred to Cleveland to succeed Mr. Falberg.

FRED J. HEID, previously vice-president in charge of sales of the Verson Allsteel Press Co., Chicago, Ill., has been appointed general sales manager of Ekstrom, Carlson & Co., Rockford, Ill., manufacturer of high-production woodworking and metalworking machinery. S. P. EKSTROM, former president and sales manager, has been appointed chairman of the board of directors.

CARL F. JENSEN has been appointed district sales manager in the midwestern area for Shakeproof, Inc. He will make his headquarters in Chicago, and will cover the territory of Illinois, Indiana, Wisconsin, Minnesota, Iowa, Missouri, and western Ohio. For the last three years, Mr. Jensen has served as field engineer for the company.

WHITING CORPORATION, Harvey, Ill., announces that it has taken over the business and plant of SPENCER & MORRIS, INC., Los Angeles, Calif., and will continue the manufacture of the tramrail type materials-handling systems previously made by that company.

F. J. STAROBA, formerly sales engineer for the Carboloy Company, Inc., Detroit, Mich., has been made manager of the midwestern district of the company, with headquarters at Chicago, Ill., succeeding W. D. BRONSON, who recently resigned to form his own company.

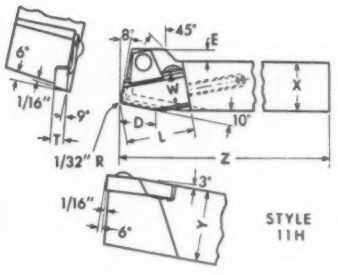
E. C. LANNO, formerly of the Detroit Diesel Engine Division of General Motors Corporation, has been named development engineer of the Rockford Clutch Division of the Borg-Warner Corporation, Chicago 4, Ill.

ALLEN-BRADLEY CO., Milwaukee, Wis., manufacturer of electric motor controls, announces the removal of its Chicago offices to new and larger quarters at 445-447 N. La Salle St., Chicago 10, Ill.

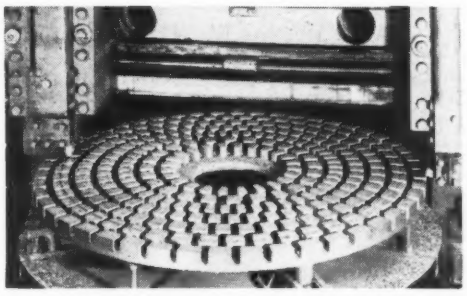
COLD METAL PRODUCTS CO., Youngstown, Ohio, manufacturer of cold-rolled carbon, alloy, spring, and stainless-steel strip metal, announces the opening of a new district office in the Illinois Building at Indianapolis, Ind. L. B. WARSTLER, formerly in the general office in Youngstown, will have charge of the new office.

IF Interrupted Cuts Are Your Problem

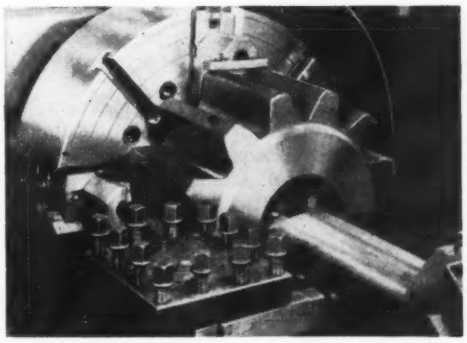
Learn About Kennametal



Style 11H is one of a complete line of Kennametal tools, having sturdy, clamped-in, advanceable Kennametal tips. This assembly—developed by Kennametal—is highly successful on interrupted cutting, and is equally outstanding on continuous-cut operations. It utilizes Kennametal's high strength to best advantage—provides a thermally-strain-free assembly; makes possible deep cuts and heavy feeds; simplifies grinding since tip is advanced and re-sharpened without removing any steel from shank; and enables practically all of the Kennametal tip to be utilized for cutting.



This iron casting has 288 chilled lump interruptions. A Kennametal standard Style 11T80 tool faces and turns it at 190 ft./min., .048" feed, and ¼" depth of cut.



Kennametal bores, turns, and faces over interruptions and sand holes on this chrome-nickel steel rack pinion. Speed—155 ft./min.; feed—.032"; depth of cut—¼" to 5/16". Performance is 5 to 1 over high speed steel tools in production and pieces per grind.

You're probably enjoying the advantages of carbide tooling on continuous-cut operations—but how about interrupted cutting?

Has this given you tool trouble, and made you resort to slower machining methods on some important jobs?

If so, Kennametal will help you solve this problem. Its ability to withstand the shock of interrupted cuts, on both cast iron and steel, has been unequalled.*

Although cutting conditions are often improved by changing the tool shape so that the shock will be imposed on a section of the tip that is stronger and better supported, it is still the carbide that must take the punishment. Here's where Kennametal has a distinct advantage.

Because of exclusive processing methods and careful control in manufacture Kennametal's impact strength is unusually high for such a hard material—as great as that of hardened alloy steels having much lower hardness and compressive strength.

Still further advantages for interrupted cutting are obtained by the use of mechanically-held tools developed by Kennametal Inc. Tips of characteristically high impact strength are securely clamped to, and firmly supported by a heat-treated steel shank, to provide an exceptionally strong strain-free assembly.

If you have had difficulty with carbide tools on interrupted cuts, let us engineer Kennametal to the solution of your particular problem.

**Ask us to send you a set of Performance Reports that demonstrate the superior results obtained with Kennametal Tools on interrupted cutting.*

KENNAMETAL Inc.

LATROBE, PA.

Trade Mark Reg. U. S. Pat. Off.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION

CUMMINS ENGINE CO., INC., Columbus, Ind., announces the appointment of the following new vice-presidents: L. W. BECK, vice-president in charge of sales; D. J. CUMMINS, vice-president in charge of engineering; and W. M. HARRISON, vice-president and treasurer.

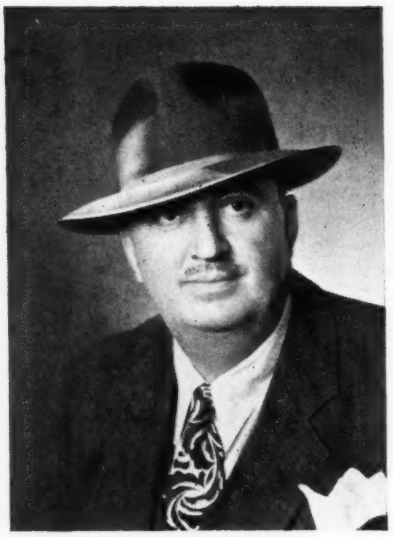
Michigan

B. & T. ENGINEERING & SALES CO., 2268 Penobscot Bldg., Detroit 26, Mich., has been organized by LOUIS W. BLAUMAN and E. MARTIN TALLBERG for the purpose of building die-casting machines and furnishing engineering and consulting service to the die-casting industry and to users of die-casting. Mr. Blauman and Mr. Tallberg were the organizers and managers of the Michigan Die Casting Co., and subsequently were president and vice-president, respectively, of the Gerity Michigan Die Casting Co.

MICRO-POISE ENGINEERING & SALES CO., 14851 Grand River Ave., Detroit 27, Mich., has recently been organized to distribute Micro-Poise balancing machines and to recommend and design suitable balancing equipment for specific jobs. The firm is headed by JOSEPH P. LANNEN and ROBERT J. LANNEN, who have been connected with the Micro-Poise staff for a number of years.

W. S. AUSTIN, sales manager of Le Maire Tool & Mfg. Co., Dearborn, Mich., has been elected vice-president of the company. He will also continue to act as sales manager. Mr. Austin joined the company in June, 1947. Prior to that, he had been connected with the Foote-Burt Co. for twenty-seven years in engineering and sales capacities.

W. S. Austin, Newly Elected Vice-president of Le Maire Tool & Mfg. Co.



A. J. Langhammer, President of Amplex Division, Chrysler Corporation, Who Received the Stevens Institute Award for Achievement in Powder Metallurgy

A. J. LANGHAMMER, president of the Amplex Division of Chrysler Corporation, Detroit, Mich., was recently presented with the Stevens Institute Award for outstanding achievement in the development and use of powder metallurgy in the production of bearings and machine parts.

WALTHAM GRINDING WHEEL CO., Waltham 54, Mass., announces that the Detroit factory branch of the company has been moved to 1433 E. Eight Mile Road, Hazel Park, Mich. WALTER W. HAYDEN has been appointed manager of the Detroit branch. A complete stock of grinding wheels will be carried at the new location.

ALLEN W. LOVELL, general manager of the Modern Collet & Machine Co., Ecorse, Mich., has been elected vice-president of the company. Mr. Lovell joined the company as sales manager in 1944 and was appointed general manager in 1946.

E. C. SWIFT has been elected president of Saginaw Industries Co., Saginaw, Mich., manufacturer of screw machine products, succeeding the late R. E. Beuthin.

A. W. ROSS, former body engineer for the Plymouth Motor Corporation, Detroit, Mich., has been promoted to the position of assistant chief engineer. He has been with the Chrysler Corporation since 1934.

D. C. MCNEELY has been appointed manager of the Morse-Rockford Sales Division of the Morse Chain Co., Detroit 8, Mich.

New England

GREENFIELD TAP & DIE CORPORATION, Greenfield, Mass., manufacturer of taps, dies, and gages, has just announced the purchase of the AMPCO TWIST DRILL CORPORATION, Jackson, Mich., maker of twist drills, reamers, and end-mills. The acquisition of the Ampco Corporation will enable the Greenfield Tap & Die Corporation to provide customers with a more complete line of drills and reamers, as well as drill engineering service comparable to the company's threading tool service. No changes are planned in the Ampco sales or production departments, as the corporation will continue to operate as a division of the Greenfield Tap & Die Corporation. FRANK J. SIKOROVSKY will continue as president and general manager of Ampco, and has been elected a director of Greenfield Tap & Die Corporation.

VAN NORMAN CO., Springfield, Mass., announces the purchase of the business of the FITCHBURG GRINDING MACHINE CORPORATION, Fitchburg, Mass. The manufacture of Fitchburg grinders, designed for use in automotive and aircraft work, will be carried on at the Van Norman plant in Springfield.

C. PORTER PACKARD has been appointed district manager of the Boston office of the Crocker-Wheeler Electric Mfg. Co., Ampere, N. J. He was previously connected with the Westinghouse Electric Corporation.

NEW DEPARTURE DIVISION, GENERAL MOTORS CORPORATION, Bristol, Conn., announces the following changes in personnel: WILLIAM J. RYAN, formerly mechanical superintendent becomes assistant to the general manufacturing manager; HARRY SIMPSON, assistant superintendent of the forge plant, has been appointed acting mechanical superintendent; HAROLD DRAPER, foreman of the transitorq department, has been made senior engineer in the mechanical department; and HERBERT A. MARONN, formerly grinding wheel supervisor for building No. 32, is now abrasive supervisor for all departments.

J. F. REED MFG. CORPORATION, 286 Hamilton St., New Haven, Conn., is a new concern specializing in the design and manufacture of plating and heat-treating racks and accessory equipment.

New Jersey

VAN WINKLE TODD, previously president of the Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturer of electroplating and polishing equipment, has been made chairman of the board and GUERIN

Triple-action drawing and forming of new Hudson tops in Bliss Toggle Press. Blank is held by outer slide while inner slide forms roof and dwells. Rear window is formed by third action in press bed.

97% BLISS

This time it's Hudson with 650 Bliss-Built Presses

From fender to top, just about every stamped part in a Hudson car is either blanked, formed, drawn or squeezed in one or more of the 650 Bliss-Built presses which total 97% of Hudson's entire press department.

"Bliss presses really stand-up under severe usage," says Hudson's master mechanic. "We've had them working 'around the clock' for several years during the war and since. Yet we've had little down-time due to press failure. They're simple to operate and maintain."

This overwhelming preference for Bliss equipment is duplicated in every pressed-metal-producing industry. It's because Bliss builds and delivers more than a press. Besides pioneering in press-construction improvements, Bliss provides a fund of engineering knowledge, going back over 90 years. "Bliss" on your press is more than a name —it's a guarantee. It will pay you to discuss your press problems with a Bliss press engineer.

Large and small end bosses on a forged connecting rod for a six-cylinder engine are compressed 3/64" in this 1200-ton Bliss-Toledo Knuckle Joint Press. Production averages 1133 per hour with an automatic chain-type feed.

Double action drawing of front fenders for the new Hudson also takes place in a Bliss-Toledo Toggle Press. Production averages about 180 per hour.

E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France. SALES OFFICES AT: Detroit, Hastings, Mich.; New York, Rochester, N. Y.; Cleveland, Dayton, Toledo, Salem, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Ill.; New Haven, Conn.; Windsor, Ont.

MARQUETTE · BLISS · CONSOLIDATED
BLISS BUILT
TOLEDO

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD

TODD, former vice-president, has been appointed vice-chairman. LOUIS M. HAGUE, also a former vice-president, has been made president and JOHN A. BAUER, previously sales manager, has been appointed a vice-president.

FILTRATION ENGINEERS, INC., 155 Oraton St., Newark 4, N. J., announced that they have taken over all the original patterns, blueprints, etc., as well as the key personnel, of the GEORGE A. OHL CO., manufacturer of squaring shears and presses. Repair parts and service on these presses are again available.

A. B. MURRAY CO., INC., Elizabeth, N. J., has recently opened a warehouse and shop for the distribution and fabrication of tubular steel products at Versailles, McKeesport, Pa. The new facilities cover a total area of 50,000 square feet.

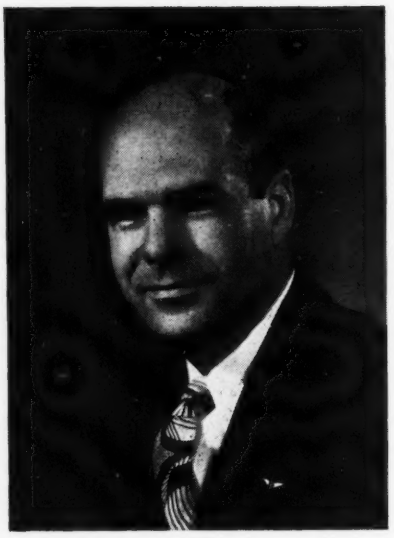
JOHN F. D. ROHRBACH has been elected president of Raybestos-Manhattan, Passaic, N. J. SUMNER SIMPSON, who has been president since the formation of the corporation in 1929, now becomes chairman of the board and of the finance committee.

SCULLY-JONES & CO., Chicago, Ill., manufacturers of production tools, have appointed the PRODUCTION TOOL SALES CO., 2 N. Dean St., Englewood, N. J., sales representative for the company in the northern part of New Jersey.

New York

AMERICAN CAR & FOUNDRY CO., 30 Church St., New York 8, N. Y., announces that a new division of the company, to be known as Tool and Die Control, has been established, with H. O. AMBLE in charge. Mr. Amble will make his headquarters at the Berwick, Pa., plant of the company, where he has been employed since 1932 as mechanical engineer. H. F. SCHWARTING has been appointed asssistant district manager of the Madison, Ill., plant of the American Car & Foundry Co. He was previously general electrical engineer at the St. Louis plant of the company.

JOHN J. LINCOLN, JR., director of sales services for the Air Reduction Sales Co., of New York, was elected president of the International Acetylene Association at the recent annual meeting. He was previously vice-president and a member of the executive committee. A. J. FAUSEK, president of Modern Engineering Co., St. Louis, Mo., was elected vice-president, and E. V. DAVID, assistant manager of the Technical Sales Division of the Air Reduction Sales Co., was elected treasurer.



Herbert H. Roosa, Vice-president in Charge of Sales of Manzel, Inc.

HERBERT H. ROOSA, for the last two years sales manager of Manzel, Inc., Buffalo, N. Y., manufacturer of force-feed lubricators and chemical feeders, was elected vice-president in charge of sales at a recent meeting of the board of directors.

LINK-BELT CO., 307 N. Michigan Ave., Chicago 1, Ill., announces the opening of a district sales office in Albany, N. Y., with headquarters at 309-310 First Trust Co., Bldg., 444 Broadway, Albany 7, N. Y. J. CHARLES BULLOCK, previously district sales manager at Schenectady, will serve as district sales manager at Albany, the Schenectady office having been discontinued.

AIR REDUCTION SALES CO., 60 E. 42nd St., New York 17, N. Y., announces that the former apparatus and arc-welding sales departments have been merged into one department, to be known as the equipment sales department, of which DALE D. SPOOR will be manager. IRA B. YATES becomes manager of arc-welding and supply sales, and J. F. CARROLL manager of apparatus sales.

H. C. HOOK CO., INC., Worcester, Mass., has been appointed sales representative for the NILSSON GAGE CO., INC., Poughkeepsie, N. Y., in the states of Maine, New Hampshire, Vermont, Rhode Island, and Massachusetts. HOMER L. LACOCK, of Rochester, has been named sales representative in the Buffalo and Rochester areas of New York State.

WENDELL G. FOGG has been appointed executive engineer of the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. He will act as assistant to the director of research and engineering.

JOHN W. CROSSETT has joined the Development and Research Division of the International Nickel Co., Inc., 67 Wall St., New York 5, N. Y. Mr. Crossett will have charge of railroad development work, succeeding the late Frederick P. Huston in that capacity.

DOSWELL ORIN WINTON has been appointed regional sales manager in the States of Michigan and Ohio for the All-State Welding Alloys Co., Inc., 96 W. Post Road, White Plains, N. Y., manufacturer of low-temperature welding and brazing alloys and fluxes.

HARRY BERNARD has been appointed chief engineer of Mack Trucks, Inc., Empire State Bldg., New York City, succeeding W. M. WALWORTH, who has resigned.

BORIS M. VOLYNSKY has been named manager of the New York City office of the Simmons Machine Tool Corporation, Albany, N. Y. The New York office is located at 50 E. 42nd St.

Ohio

HOWARD M. HUBBARD has been appointed president of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, to fill the vacancy created by the resignation of H. A. TOULMIN, JR. Mr. Hubbard has a background of twenty-five years of management and production experience. He has served as president of the Elliott Co. at Jeanette, Pa., and of the Greenfield Tap & Die Corporation, Greenfield, Mass. For the last three years, Mr. Hubbard has been engaged in consulting and development engineering practice.

Howard M. Hubbard, Newly Appointed President of the Hydraulic Press Mfg. Co.

MACHINERY'S DATA SHEETS 611 and 612

RECOMMENDED SHANK SIZE FOR SINGLE-POINT CARBIDE-TIPPED TOOLS—1

The alignment chart in Data Sheet No. 612 can be used to quickly determine the proper shank size to use in designing single-point carbide-tipped tools. In the past, general recommendations for the use of heavy shanks and rigid set-ups have resulted in wide variations in the shank size employed for a specific set-up.

This chart was prepared to permit the selection of a reasonable shank size for any specific job. It is based on experience and checked with calculations of the load applied on the tool while cutting. The load on the tool is determined by the depth of cut and feed employed for the operation. The bending moment that the shank of the tool must resist is determined by the distance that the tool overhangs or projects from the tool-holder. These three variables—depth of cut, feed, and overhang—must be known in order to select the recommended shank size from the chart.

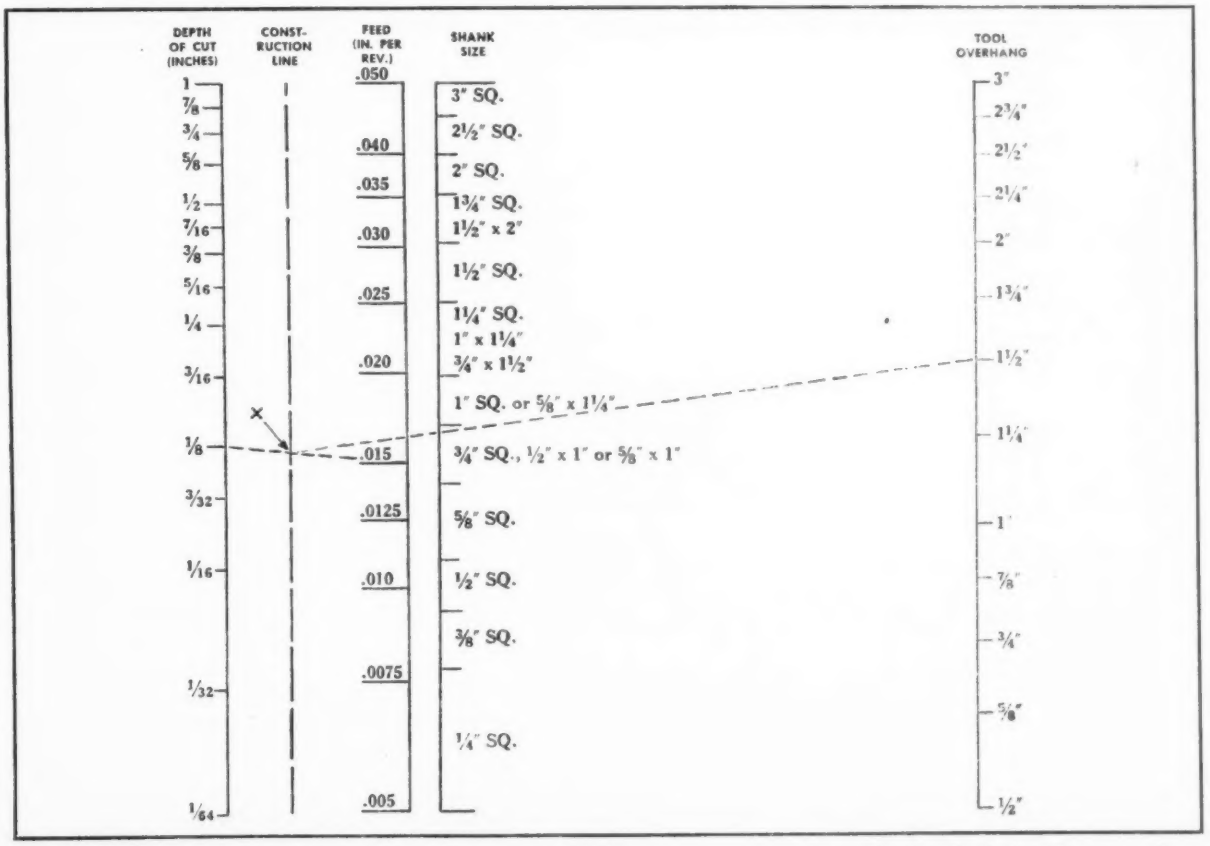
To use the chart, the depth of cut (in inches) is located on the scale at the left-hand side and the feed (in inches per revolution) on the next scale to the right. A straightedge is then laid between these two points, and the point of intersection with the broken construction line, which lies between these two scales, is marked. The amount of tool overhang is then located on the scale at the right-hand side of the chart, and a straightedge is laid between this point and the one marked on the construction line. The recommended shank size can then be read directly on the scale provided for this purpose.

For example, if a feed of 0.015 inch per revolution and a depth of cut of 1/8 inch are to be used, the straightedge is laid on the chart so as to connect these two points, as indicated by the broken line at the left; the line thus located intersects the construction line at point *X*. If the tool overhang is 1 1/2 inches, the straightedge is next laid between the 1 1/2 mark on the overhang scale and point *X* on the construction line, as shown by the broken line at the right. The recommended shank size can then be selected from the range given where this line intersects the shank size scale. In this case, a 3/4-inch square, 1/2- by 1-inch, or 5/8- by 1-inch size shank could safely be used.

MACHINERY'S Data Sheet No. 611, June, 1948

Compiled by Carboloy Company, Inc., Detroit, Mich.

RECOMMENDED SHANK SIZE FOR SINGLE-POINT CARBIDE-TIPPED TOOLS—2

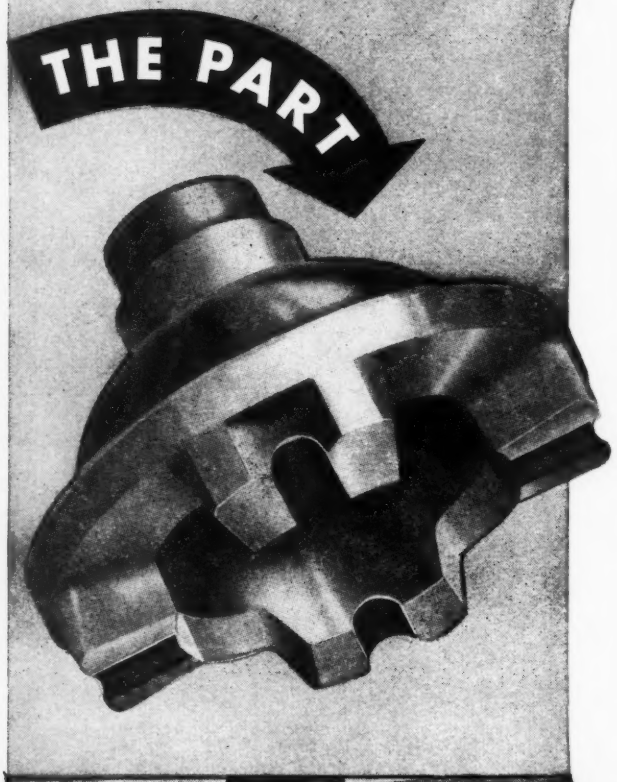


MACHINERY'S Data Sheet No. 612, June, 1948

Compiled by Carboloy Company, Inc., Detroit, Mich.

Broaching

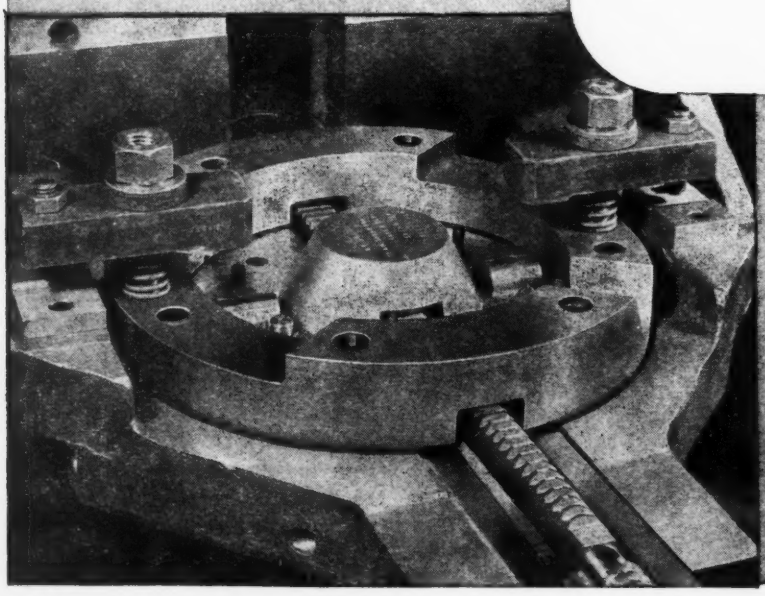
AUTOMOTIVE DIFFERENTIAL CASES *Faster* – ACCURATELY



Detroit Broach designed and built the complete tooling to broach differential cases for a Detroit automotive parts manufacturer. One pair of notches is broached and then the fixture indexes 90° and the other pair of notches is broached. The operation is performed on a horizontal broaching machine and from 1/16" to 1/8" stock is removed from these steel forgings in one pass. The speed and accuracy of the operation cannot be equaled by any other method.

This is one of the many applications that Detroit Broach has worked out for the automotive industry . . . and for many other industries, too. Perhaps you can realize real savings by applying broaching to the processing of *your* product. Detroit Broach will gladly study your product, recommend the broaching operations and give you cost and production data for each. Write now.

DETROIT *Broach* COMPANY
20201 SHERWOOD AVENUE
DETROIT 12, MICHIGAN



Moffett Studio

Moffett Studio

(Left) Stanley A. Brandenburg, Newly Appointed Sales Vice-president and (Right) Kermit T. Kuck, Engineering Vice-president of the Monarch Machine Tool Co.

STANLEY A. BRANDENBURG, general sales manager of the Monarch Machine Tool Co., Sidney, Ohio, was made sales vice-president at a recent meeting of the board of directors, and KERMIT T. KUCK, chief engineer, was named engineering vice-president. Both men have been with the company since they entered business—Mr. Brandenburg in 1927 and Mr. Kuck in 1934.

MORTON - GREGORY CORPORATION OF MICHIGAN, with executive and sales offices in the Manhattan Bldg., Toledo, Ohio, has recently purchased the manufacturing assets and patents of the NELSON STUD WELDING CORPORATION, Lorain, Ohio, and its associated companies. The Morton-Gregory Corporation is a recently established concern in the electrical specialty field. HENRY J. MORTON is president of the new concern, and GEORGE E. GREGORY is vice-president and general manager.

MIDWEST TOOL & MFG. CO., Detroit, Mich., manufacturer of metal cutting tools, has removed its plant, manufacturing facilities, and executive offices to Upper Sandusky, Ohio. The new plant provides almost twice the operating floor space available in the old plant. Company-operated branch offices are being retained in Detroit at 2360 W. Jefferson Ave., and in Chicago at 549 W. Washington Blvd.

W. R. HOUGH, chief engineer since July, 1945, of the Reliance Electric & Engineering Co., Cleveland, Ohio, was elected engineering vice-president at a recent meeting of the board of directors. He has been connected with the company since 1929, following his graduation from the University of Michigan.

FOULK MFG. CO., 4208 Airport Road, Cincinnatti, Ohio, announces that it has recently taken over the manufacture and sale of tap cartridges. A tool-room kit containing a variety of sizes of tap cartridges is being placed on the market.

W. R. PERSONS, general sales manager of the Lincoln Electric Co., Cleveland, Ohio, and K. F. STEINGASS, superintendent of electrode manufacture, have been elected members of the board of directors.

AMERICAN ROLLING MILL CO., Middletown, Ohio, announces that the name of the company was officially changed to the ARMCO STEEL CORPORATION at a recent meeting of the stockholders.

LAWRENCE F. BLACK has been appointed assistant chief engineer of the American Steel & Wire Co., Cleveland, Ohio, and CHARLES B. HULL has been named assistant division engineer.

ROBERT E. BUSEY, acting chief engineer for Willys-Overland Motors, Toledo, Ohio, has been promoted to the position of chief engineer, succeeding WALTER D. APPEL.

Pennsylvania

FELIX WUNSCH, of the engineering staff of the Leeds & Northrup Co., Philadelphia, Pa., has retired after nearly forty-three years of service with the company. Mr. Wunsch joined the Leeds & Northrup organization in 1905, and first worked in the laboratory making electrical instruments. In 1909, he was named assistant foreman in the laboratory, and subsequently became assistant to the chief engineer in the engineering department. Later he was made technical advisor to that department. From 1910 on, he was engaged largely in electrical design, during which period he developed and perfected numerous circuits widely used in electrical measuring instruments. Mr. Wunsch has twelve patents to his credit.

OMAR V. GREENE has been promoted from the position of assistant general sales manager of the Carpenter Steel Co., Reading, Pa., to manager of product development, and H. STURGIS POTTER has been promoted from manager of tool steel sales to sales manager in charge of all Reading products. Mr. Greene joined the company in 1928 as a staff metallurgist, and was made assistant general

(Left) Omar V. Greene, Manager of Product Development for the Carpenter Steel Co. (Right) H. Sturgis Potter, Newly Appointed Sales Manager of All Reading Products

sales manager in 1947. Mr. Potter became connected with the company in 1936 as a sales engineer, with headquarters in Indianapolis. In 1947, he was made manager of tool steel sales.

C. J. LEROUX has resigned as a director and vice-president in charge of sales of the Freedom-Valvoline Oil Co., Freedom, Pa., to engage in business for himself in Cincinnati. HARRY I. JOHNSTON, formerly manager of sales, and associated with the company for twenty-seven years, has been elected a director, and will succeed Mr. Leroux as vice-president in charge of sales. HAROLD J. DUNMIRE, previously manager of the Butler plant will assist Mr. Johnston in the capacity of manager of sales.

DAVID M. SALSBURY has been elected president of the Westinghouse Electric Supply Co., Pittsburgh, Pa., succeeding B. W. CLARK, who previously held the dual posts of president of the Westinghouse Electric Supply Co. and vice-president in charge of sales of the parent company. Mr. Clark will continue to have responsibility for all sales activities of the Westinghouse Electric Corporation.

GIRARD ASSOCIATES, with offices in Philadelphia and Chambersburg, Pa., has recently been formed to specialize in sales and engineering, primarily in the forge and press shop field. The firm is now representing manufacturers of metal-working machines and heat-treating and vibration control equipment. HARRY L. SHOWALTER, JR., is head of the new company.

W. F. DETWILER, who has been chairman of the board of directors of the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., for the last ten years has been named honorary chairman. LESTER H. BITTNER, director of purchases, has been elected to the newly created position of vice-president in charge of purchases.

ENERGY ENGINEERING CO., 5252 N. Broadway, Chicago, Ill., has been appointed representative for the industrial furnaces made by the R.-S. PRODUCTS CORPORATION of Philadelphia, Pa. WILLIAM C. SCRIMGEOUR, 1013 Eighteenth St., N.W., Washington, D. C., has also been appointed a representative of the company.

ARCOS CORPORATION, manufacturer of welding electrodes, announces the removal of its general offices to Fiftieth and Paschall Ave., Philadelphia 43, Pa., where all activities of the company are now consolidated.

PHILLIP A. BOHLANDER has been appointed assistant works manager of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

A. B. Vestal, Who Recently Joined the Firth-Sterling Management Staff

A. B. VESTAL has joined the management staff of the Firth Sterling Steel & Carbide Corporation, McKeesport, Pa. Mr. Vestal, a graduate of Carnegie Institute of Technology in metallurgical engineering, was previously connected with the Carnegie-Illinois Steel Corporation, Pittsburgh, Pa.

LESTER M. CURTISS, previously general manager of steel plants for the Lukens Steel Co., Coatesville, Pa., has been named general works manager of the company and its divisions, the By-Products Steel Co., and Lukenweld. L. P. MCALLISTER has been appointed manager of steel plants.

HARRY L. SHOWALTER, for many years associated with the drop-forging industry in various capacities, has been appointed sales representative in eastern Pennsylvania, New Jersey, Maryland, and Delaware for the Erie Foundry Co., Erie, Pa., manufacturer of forging hammers and hydraulic presses.

BROWN INSTRUMENT CO., Philadelphia, Pa., announces a $2,500,000 expansion program which will add more than 60 per cent to the company's present manufacturing space and will provide a proportionate increase in employment.

D. W. R. MORGAN and JOHN K. HODNETTE have been elected vice-presidents of the Westinghouse Electric Corporation, Pittsburgh 30, Pa., and E. V. HUGGINS has been elected secretary.

EDWARD M. GRIFFITH was recently appointed executive vice-president of the Jessop Steel Co., with headquarters at Washington, Pa.

Wisconsin and Minnesota

ACRO WELDER MFG. CO., Milwaukee, Wis., has been reorganized and plans have been made to expand the engineering and production facilities of the concern and to make design changes in the Acro line of spot, seam, projection, and portable gun resistance-welding machines and brazing machines. The new officers of the company are as follows: President, J. C. WILSON, JR., formerly executive vice-president and director of Burlington Mills, Inc., Burlington, Wis.; vice-president, L. R. MATTHEWS; secretary, W. C. MESSINGER; treasurer, J. C. WILSON, SR.; and assistant secretary-treasurer, T. B. WILSON.

AMPCO METAL, INC., Milwaukee 4, Wis., has appointed the following concerns distributors of Ampco welding electrodes: CAR PARTS DEPOT, INC., 712-720 Texas St., El Paso, Texas; EAGLE METALS CO., 3628 E. Marginal Way, Seattle, Wash.; and GIBSON WELDING SUPPLIES, E. 218 Trent Ave., Spokane, Wash.

JAMES M. WHITE, formerly vice-president in charge of manufacturing at the Milwaukee plant of the Allis-Chalmers Co., has joined the production management staff of the Allen-Bradley Co., Milwaukee, Wis.

DON R. MANECKE, who has been general manager of the Rochester Gear Works, Rochester, Mich., for the last three years, has been made sales manager of the company, with headquarters in Milwaukee, Wis.

JOHN A. SLENKER has been appointed general superintendent of the Duluth, Minn., Works of the American Steel & Wire Co., Cleveland, Ohio.

J. C. DUKE has been elected vice-president in charge of the Coated Abrasives Division of the Minnesota Mining & Mfg. Co., St. Paul, Minn.

* * *

New Motion Picture on Aluminum

A technicolor motion picture entitled "Curiosity Shop" has been produced by the Aluminum Co. of America. The film presents the story of research and development in making aluminum more useful. Sixteen- and thirty-five-millimeter prints of the film will be available on July 1. Requests should be made to Motion Picture Department, Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh 19, Pa; Modern Talking Picture Service, 9 Rockefeller Plaza, New York 20, N. Y.; or Farm Film Foundation, 1731 I St., N. W., Washington 6, D. C.

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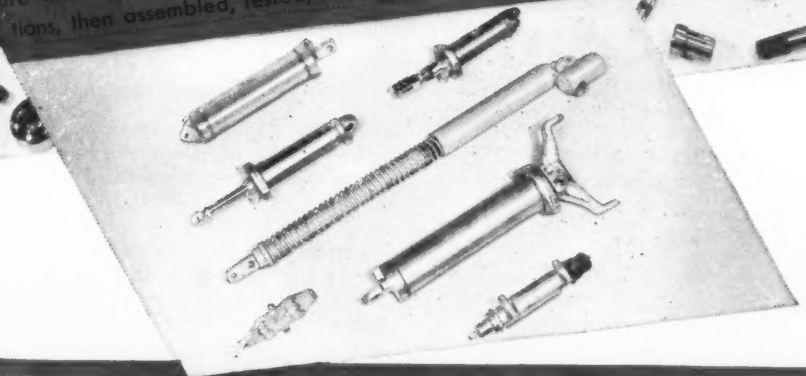
You don't take chances when Ex-Cell-O builds your aircraft parts and assemblies

Ex-Cell-O is a pioneer in bringing accuracy and high production to the manufacture of metal parts and assemblies for aircraft engine builders and other aviation industries. . . . Three huge Ex-Cell-O plants in Detroit have the most modern and complete facilities for rough and finish machining of precision parts from bar stock, forgings and castings, for heat treating all types of work in large or moderate quantities, for assembling parts with highly skilled supervision and inspection . . . all under one experienced, responsible management. Ex-Cell-O works exactly to the customer's specifications and ships the parts in whatever volume is required. . . . Send Ex-Cell-O a sketch, sample part, or a blueprint for quotation, or get in touch directly with the Head Office of Ex-Cello Corporation, 1200 Oakman Blvd., Detroit 32, Mich.

Above: Aircraft gasoline injection nozzles such as those illustrated above are manufactured and assembled by Ex-Cell-O.

To left: Group of typical precision aircraft parts manufactured by Ex-Cell-O to customers' specifications and in any volume.

Below: Individual parts of these aircraft sub-assemblies are manufactured by Ex-Cell-O to customers' specifications, then assembled, tested, shipped as complete units.



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Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Other Special Purpose Machines • Standard Precision Boring, Turning and Facing Machines and Fixtures • Precision Cylinder Boring Machines • Precision Thread Grinding Machines • Precision Lapping Machines • Precision Broach Sharpening Machines • Tool Grinders • Hydraulic Power Units • Drill Jig Bushings • R. R. Pins and Bushings • Fuel Injection Equipment • Dairy Equipment • Aircraft and Miscellaneous Production Parts • Continental Cutting Tools • Broaches and Broach Fixtures • Counterbore Sets • Face Milling Cutters • Grinding Spindles

Coming Events

JUNE 21-25—Annual meeting and exhibit of the AMERICAN SOCIETY FOR TESTING MATERIALS in Detroit, Mich. Society headquarters, 1916 Race St., Philadelphia 3, Pa.

JUNE 24-26—FOURTH ANNUAL EASTERN SEABOARD APPRENTICESHIP CONFERENCE at Lake Placid, N. Y. Further information can be obtained from the State of New York, Department of Labor, Albany, N. Y.

JUNE 28-JULY 1—Annual convention and Industrial Finishing Exposition of the AMERICAN ELECTROPLATERS SOCIETY in Convention Hall, Atlantic City, N. J. National office of the Society, Jenkintown, Pa.

AUGUST 10-13—First WESTERN PACKAGING EXPOSITION AND CONFERENCE ON PACKAGING, PACKING, AND SHIPPING at the Civic Auditorium, San Francisco, Calif. Sponsored and managed by Clapp & Poliak, Inc. Empire State Bldg., New York 1, N. Y.

AUGUST 26-SEPTEMBER 11—INTERNATIONAL MACHINE TOOL AND ENGINEERING EXPOSITION at Olympia, London, England. Sponsored by the Machine Tool Trades Association, Victoria House, Southampton Row, London W.C., England.

SEPTEMBER 13-17 — THIRD INSTRUMENT CONFERENCE AND EXHIBIT under the sponsorship of the Instrument Society of America, Pittsburgh 12, Pa., in Convention Hall, Philadelphia, Pa.

SEPTEMBER 27 - OCTOBER 1 — THIRD NATIONAL PLASTICS EXPOSITION in Grand Central Palace, New York. Sponored by the Society of the Plastics Industry, Inc. Chairman, Nelson E. Gage, 295 Madison Ave., New York City.

OCTOBER 11-13 — Sixteenth annual convention of the NATIONAL LUBRICATING GREASE INSTITUTE at the Edgewater Beach Hotel, Chicago, Ill. Executive Secretary, Carl E. Bolte, 4638 Mill Creek Parkway, Kansas City 2, Mo.

OCTOBER 20-22 — Thirtieth annual meeting of the AMERICAN STANDARDS ASSOCIATION at the Waldorf-Astoria Hotel in New York. Secretary, G. F. Hussey, Jr., 70 E. 45th St., New York 17, N. Y.

NOVEMBER 4-6 — Annual Technical Forum of the NATIONAL ELECTRONICS CONFERENCE, INC., at the Edgewater Beach Hotel, Chicago, Ill., under the joint sponsorship of the Illinois Institute of Technology, Northwestern University, American Institute of Electrical Engineers, Institute of Radio Engineers, and the University of Illinois. Further information can be obtained from J. A. M. Lyon, Northwestern Technological Institute, Evanston, Ill.

NOVEMBER 28-DECEMBER 3 — Annual convention of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. Secretary, Clarence E. Davies, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 29-DECEMBER 4 — EIGHTEENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING at the Grand Central Palace in New York. Chairman of the advisory committee, I. E. Moultrop, Grand Central Palace, New York 17, N. Y.

New Books

MILLING WITH CARBIDES. 41 pages, 8 1/2 by 11 inches. Published by the Milling Cutter Division of the Metal Cutting Tool Institute, 410 Asylum St., Hartford 3, Conn. Price, $1.

A few years ago, the Milling Cutter Division of the Metal Cutting Tool Institute appointed a committee to study the carbide milling cutter field, with a view to effecting some standardization of design. The present book contains the report of this committee on carbide cutter design, manufacture, and application. The information was obtained through the cooperation of carbide material producers, carbide cutter manufacturers, machine manufacturers, and tool users, as well as from experimental work on cutter design and applications. The seven sections of the report cover the following phases of the subject: General Considerations in Applying Carbides to Milling; Grades of Carbide and Their Application to Milling; Nomenclature for Carbide Milling Cutters; Machine Tools and Fixtures for Carbide Milling; Carbide Milling Cutter Design; Operating Techniques for Carbide Milling; Sharpening and Care of Carbide Milling Cutters.

FLEXURAL FATIGUE STRENGTH OF STEEL BEAMS. By Wilbur M. Wilson. 34 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Bulletin No. 377 of the Engineering Experiment Station. Price, 20c.

* * *

The American Rolling Mill Co. is producing an aluminized steel, consisting of steel sheet to which an aluminum coating is applied so as to protect the steel from corrosion.

Obituaries

Wilson P. Hunt

Wilson P. Hunt, co-founder of the Moline Tool Co., Moline, Ill., died on April 4. He was born on January 22, 1873, in Moline and continued to live in that city throughout his life.

MR. Hunt started work on August 15, 1890, as an apprentice at Williams-White & Co., where he learned the machinist's trade. From there he went to the Deere & Mansur Works, where he was employed in the experimental department. In March, 1901, Mr. Hunt, together with George Ahrens, organized the Moline Tool Co., and Mr. Hunt served as president and general manager of the company until 1926; thereafter, he acted as consulting engineer and held the office of vice-president until his death. In addition to his business and engineering pursuits, Mr. Hunt was active in philanthropic and religious work, both in his home city and elsewhere. Surviving him are his widow; a daughter, Mrs. Ruth Pascoe; and a foster son, James W. Hunt, of Des Moines, Iowa.

WILLIAM P. ROSS, vice-president and a director of the Standard Tool Co., Cleveland, Ohio, died suddenly at his home in Rocky River on April 21 at the age of sixty-three years. Mr. Ross had been associated with the company since 1902, and had worked his way up through the ranks to the executive position he held at the time of his death. He had long been active in sales promotion for the concern, traveling extensively throughout the United States, and was widely known in the metal-working, hardware, and mill supply industries. He is survived by his wife and one son.

EDWARD N. GREENLEAF, former Los Angeles district office manager for the Allis-Chalmers Mfg. Co., Milwaukee, Wis., died on April 10 at the age of seventy-three. Mr. Greenleaf joined the Allis-Chalmers organization in April, 1912, as a sales representative in the company's Salt Lake City office. On November 1, 1921, he was transferred to the Los Angeles office as manager, which position he held for fourteen years. He retired from the company on January 1, 1947.

ALLAN E. GOODHUE, vice-president and director of the Chicago Pneumatic Tool Co., with general offices in New York City, died on April 20 after a short illness. Mr. Goodhue joined the company in 1919, and had charge of the company's interests in England until June, 1920. At that time, he returned to this country and was elected vice-president in charge of sales. He is survived by his wife and a sister.